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GLIMPSES
AT THE
PLANT WORLD

Fanny D. Bergen

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GLIMPSES
AT THE
PLANT WORLD

BY
FANNY (D. *ickerson*) BERGEN

"To me the meanest flower that blows can give
Thoughts that do often lie too deep for tears"

WORDSWORTH

Fully Illustrated

BOSTON M^{DCCCXCII}

LEE AND SHEPARD PUBLISHERS

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pussy-willow catkins, in the very first spring days, and the scarlet mist made a little later by the thick clusters of the tiny red flowers of the maples along the still leafless branchlets, to the plumes of the goldenrod and the modest asters of early autumn, each week and almost each day brought some new blossom for which to search in woods or fields. The



THE SPRING-BEAUTY.

spring-beauty with its gracefully hanging buds and pink-and-white bells, which is to Western children what the sweeter Mayflower is to those who live in New England, came very early in the spring, and grew plentifully both in woodlands and in grass-fields, particularly along the fence-rows. About

the same time, at the roots of old stumps or in sheltered nooks we might expect to find clumps of the large, thick leaves of the bloodroot unrolled enough to show the pale stems, each crowned with the white flower whose petals so soon fall from the yellow centre in a snowy shower. On the side of a low hill stood the only service-berry tree in our neighborhood. When it shook forth its filmy white blossoms we felt that the wild-flower time had really begun. Later, on the borders of the woods the showy dogwoods hung out their white or sometimes pale rose-colored banners. The flowery branches both of service-berry and of dogwood were easily



BLOODROOT.

brought down so low that we could grasp them ; but later on, when the beautiful orange and pale-green flowers of the stately tulip-trees came, they were far beyond reach. Sometimes a pelting rain broke off a few of these great flowers ; and as I afterwards picked them from the ground and looked into their cups, I thought what a wonderful place it must be away up in the tall treetop, among the multitudes of blossoms and green leaves. The airy gardens that I longed for, however, are visited by many winged insects, among them a kind of glistening, bronzy-green beetle ; for such little creatures are pretty sure to be found crawling about in the flower-cups of the tulip-tree. It was not until late June that the bunches of creamy tassels on the chestnut-trees gave promise of our favorite nut.

While speaking of tree-flowers, I ought not to forget the fruit-trees in the orchard near the house. We used to watch the little knobs of buds all along the twigs and branches of the peach-trees, seeing them swell in the warm spring showers until they began to open enough to show a little pink color ; then, after a day or two of hot sunshine, the whole

peach-orchard suddenly burst into one great cloud of rosy bloom. But the fragrance of the peach-blossoms did not compare with the sweet, healthful odor of the pink-and-white apple-blossoms, which you all know so well. Then there was the wealth of blossoms on the scattered pear and cherry trees, and bending somewhat over our spring were two or three wild plum-trees. In the early morning, I was often sent to fetch a pail of cool water; if these trees were a-bloom, I loved to stand under them, breathing in the sweet, strong perfume of their white blossoms, which were alive with droning, humming honey-seekers; and before I filled my pail dozens of the curving white petals that had fallen from the overhanging boughs, and that floated on the water like tiny boats, had to be pushed aside.

But to go back to the wild flowers. There were the little yellow blossoms of the spice-wood, set close to the twigs, whose fragrant bark we liked to eat. In a little glade, through which flowed a brook, I remember there came up by the hundred, early in the season, a kind of pretty fern. By the time the ferns were well unrolled, blue violets

began to open, and then came the spotted leaves of the adder's-tongue and its yellow, lily-shaped flowers. On a certain hillside I was sure to find the



ADDER'S-TONGUE.

first hepaticas,— some of a sea-shell pink, and others of a rare blue or purple. I never could quite decide which I liked better, these lovely spring blossoms, or the last year's leaves all mottled with rich red and purple and green. If you know the hepatica,—or liverwort,

as it is often called,— you know how the old leaves last over the winter, come out from under the snow in deep warm colors, and linger awhile about the fresh buds and blossoms before they give place to new leaves that in soft downy coats

slowly push their way up into the light. Then there were the pepper-root, the dainty bishop's cap, the lovely rue-anemone, — known with us as



HEPATICAS.

the wind-flower, — the snowy wake-robin, and the wild pink geranium, or crane's bill. The flower of the Indian turnip, which you know as "Jack in the Pulpit," I gathered in the spring with my wild

flowers ; and one of the brightest bits of color in the autumn woods was made by its ripened fruit,



RUE-ANEMONE.

the clustered bunches of scarlet berries. I knew one spot where the partridge-berry grew, and in

one particular wood-pasture I was pretty sure to find a pink and white orchid, which the children where I lived called "Adam and Eve," because of its single pair of broad green leaves. The root of this plant we prized because by cutting



WAKE-ROBIN.

and squeezing it we obtained a sticky juice which was very useful in mending broken dishes in our playhouses. Among the commonest of our wild flowers were two kinds of pink phlox which we called "wild sweet-william."

I call to mind two wild flowers that were so

scarce in our part of the country that it was counted a lucky find to secure either of them. One was the showy yellow lady's-slipper, all dappled with red. This is sometimes called the moccasin-flower. The other was the brilliant fire-pink. I never found this about my own home except on the edge of a certain sandy ledge that faced the south, and I never begrudged a walk of a mile or two if I could bring home even one or two of the tropical-looking flowers that seemed to have caught and kept the glory of the hot summer sun. The common dark-blue violet we found everywhere, both in woods and fields; but a lovely velvety white one, with delicate purple markings, grew only in a few chosen places in the rich soil of deep woods. The yellow violet, too, was quite rare. Much of the big meadow through which ran the same little brook of the wood-glade was fairly carpeted in spring with violets. There was the common blue one that everybody knows, a pale-blue one with funny long spurs, and a small greenish white violet, very different from and not half so pretty as the beautiful one of the woodlands; and yellow buttercups, with their varnished petals, starred the whole meadow.

Here, too, grew the graceful brown-spotted red and yellow field-lilies ; but they did not bloom until mid-summer. I rarely had the pleasure of gathering these regal blossoms with my own hands, for by the time they were ready to bloom we were forbidden to run through the meadow, lest we should trample and tangle the high timothy-grass, as the



BLUE VIOLETS.

mowing season was at hand. However, when the mowers with their shining scythes cut the grass, if my father was in the field he was sure to look out for the lilies and to pick them out from the swaths of grass and stand them in a jug of water that was kept in a shady place for the men to drink. Then he would call to me, and I would run from the house to the hayfield, to bring back

the tall stalks surrounded with their long tapering leaves, each bearing at its summit several splendid flowers. I used to think these must have been the kind that Christ meant when he said, "Consider the lilies of the field." I have since learned that the wild lilies of Palestine are much like our own.

But it would take too long to mention half of the plants, flowers, and fruits that I used to play with in northern Ohio, where I lived when I was a child. There were all sorts of lovely and interesting things: the velvety mosses which we used to bring from the woods by the basketful, with which to carpet our playhouses; the pale little ghosts of plants named Indian pipes; the gay leaves of autumn; the bright berries of wild vines, shrubs, and trees, — each and all were welcomed in their time. Well, I was so glad in their company that I wish you to know and to enjoy every one of the growing things with which you meet.

I.

WHAT IS A PLANT?

ONE fine spring morning, as I sat thinking about the fresh young grass, the pussy-willows, and the scarlet blossoms on the maple-trees, my little friend Jack came into the room. "Jack," said I, "have you noticed how pretty the green grass is, and how many plants are beginning to wake up from their winter sleep?" Jack had seen it all and had felt the beauty of it all, but had not thought much about it; and when I asked him if he could tell me what a plant was, he seemed quite surprised at my asking



Moss.

such a simple question. "Why, a plant is — let me see — a plant is something that has leaves and flowers." Then I picked up a bit of moss out of a saucerful that was standing on the window-sill and asked Jack if that was a plant. He said that it was. "But has it any flowers?" said I. He felt sure that moss never had flowers ; so then I asked him why he thought that it was a



A COMMON
SEAWEED.

plant. After looking at it for a minute, he answered, "Because it has little things like leaves." Now, that seemed to me a very good answer, and I told Jack so. Then I tried him with a bit of dry seaweed, of the common bladder-kind, that happened to be lying on the table among some shells and other sea-things which we had brought from the beach the summer before. He felt quite sure that this was a plant, too (perhaps the name *sea-weed* helped him) ; but he could n't give any very good reason why. "Now, Jack," said

I, "are you ready by this time to tell me what a plant is?" He seemed a little puzzled, but said at

last, "Anything that grows is a plant." But when I asked whether a dog grows, and if so, whether a dog is a plant, Jack saw that this answer would n't do either. We finally decided that we might safely say that the things that grow are either animals or plants, and Jack felt sure that any one with common-sense could tell an animal from a plant ; for he said that while animals can hear, smell, taste, and feel, plants cannot ; animals can travel about, but plants cannot. However, after we came to talk it over a little more, we found that some of the things that Jack had said about the differences between animals and plants were not in every case correct ; for such animals as oysters and sponges cannot see nor move about, and there are some plants that seem able to feel, and many tiny ones, which live in the water, that move about freely. At last we decided that while it is easy enough to tell which is the animal and which the plant when we are looking at a dog and a rose-bush, it is not easy at all to make up one's mind whether to call some of the simplest and smallest of living things animals or plants. Many of these least of all living things are so very small that we could not see one of them

with the eye alone, and in order to learn anything about their form, size, and color people have to study them with glasses that make things look many times larger than they really are. Such a glass is called a microscope.¹

¹ Thoroughly good compound microscopes are expensive instruments. There are, however, a few cheap kinds to be had, by aid of which children may be shown and may soon learn to discover for themselves great numbers of interesting objects. The household microscope, furnished by Jas. W. Queen & Co., 924 Chestnut Street, Phila., for about \$6, will serve to show most of the microscopic objects referred to in this little book. Its magnifying power is too low to enable one to make out the structure of the yeast-plant, but it will enable children to see and understand something of the structure of mould and all the larger fresh-water algæ.

II.

THE PLANT WHICH MAKES BREAD RISE.

IF you have ever watched your mother mix bread, perhaps you know that the yeast which is stirred into the bread-sponge causes it to rise ; but do you know that this means that the yeast is growing? That is really what is going on ; for yeast is a living thing, and as it grows it causes very small bubbles of gas to rise all through the bread-dough, so as to make it swell up and become light, that is, full of small holes. If you put a drop of yeast and water on a slip of glass and look at it with a strong microscope, you may see that yeast is made up of little round things like toy balloons, with a covering as thin as that of a soap-bubble ; only these tiny balloons that compose yeast are full of soft pulp almost as thin as water. Now, what will you say when I tell you that each of these tiny little bubbles is a plant ? But these plants are so small that you could lift

many thousands of them on the point of a pin, so of course we can only see them and learn about



YEAST-CELLS
(greatly magnified).

how they grow by looking at them through a microscope, which makes them seem a great deal larger than they really are. If you were to watch these little plants with a microscope, you would find each

one of them growing for a while, and by-and-by, when it gets to its full size, sending out a smaller bubble on one side, after which that grows to be as large as the first, and in time this second plant sends out another, and so on ; for you must remember that each single one of these small, round, soft balls is a whole plant. The yeast-plants need to be in a warm place and to have plenty of water in order to grow. But if a speck of yeast be put in a quart bottle of lukewarm water which is sweetened a very little, and the mixture be allowed to stand for a few hours in some warm place, the whole bottle of water will be alive with yeast-plants.

The next time that your mother sets her bread, remember she is putting those little plants in a

warm, moist place, so that they may grow rapidly, and thus cause the bread to rise ; if they do not grow, the bread will not be light. There are very many kinds of these tiny plants in the world, something like the yeast-plant ; a few of them are very useful, while others do great harm. Such tiny growing things are so plentiful that often the food we eat, the water we drink, and the very air we breathe swarm with them or with the dust-like particles from which they grow ; but our eyes are not keen enough to see them except when multitudes of them are piled up together, as they are in a cake of compressed yeast.

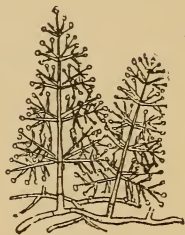
III.

WHAT IS MOULD?

ALL of you must have noticed the little downy patches, sometimes blue and sometimes white, that are apt to come on your boots or shoes if you leave them long in a dark, damp place. You call such little spots mould; but do you think of mould as a plant that grows in its own way just as truly as violets and the green grass grow in their way? There are ever so many different kinds of moulds. You have probably seen the fuzzy blue kind that grows on old cheese, or on stale bread if it be kept in a damp closet; or the thick white velvety mould that often grows over the surface of preserves or canned fruit. I have sometimes seen the top of a cup or glass of jelly quite covered with a smoke-colored mould that grows up into slender branches which so interlace that when any one examines

the growth carefully it looks like a delicate forest of mimic trees. Such mould as this when seen through a microscope is very lovely.

Nature is full of beautiful things that are too small and delicate for our unaided eyes to see. Men often try to make their front doors beautiful, and their carpets and sugar-bowls and plenty of large ornaments and pieces of furniture, but in Nature we find beautiful forms and



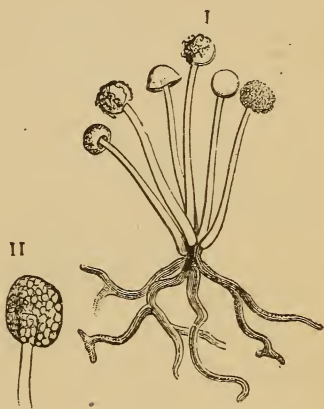
MOULD
(seen through the
microscope).

carvings and colors in things so very small that to see them at all we must look at them through a microscope. I once went with a young lady to give directions to her dressmaker for making a lovely blue silk dress. The thing that my friend was most particular about was that the dress should be well made on the wrong side. She said, "Be sure to finish it nicely on the wrong side; I wish it to be neat and pretty on the wrong side." That was like Nature. Atoms of seeds such as poppies shake out of their pepper-box pods, or such as the shining morsels that you

may see lying piled up when you take the cone-shaped lid from off the little seed-dish of the portulaca, when magnified, are seen to be wonderfully sculptured. Some of these very moulds of which we are talking, when looked at through a microscope, seem like magic gardens of delicate plants laden with wonderful fruits.

I told you that the moulds are all plants, and that they grow; but I suppose you say, "What makes them grow? who sows their seeds?" These rapidly growing plants do not come, as do very many of our vegetables and garden flowers, from seeds that must be planted in the earth; the moulds all grow from tiny dust-like particles that are called spores. These spores grow in little pouches or cups that are borne on the moulds just as seed-pods or fruits are borne on flowering plants; for the moulds do not have blossoms or real fruit, but only the pretty little vessels in which grow thousands upon thousands of the speck-like spores. These spores do not need to be covered with earth in order to grow; but if they fall on any damp surface in a dark or shaded place, new mould-plants like those that bore the spores may grow

from them. Now, do you ask where the spores come from, and how they get into our pantries and closets, and cellars and sheds, to cause the moulds of various kinds to grow on our food or clothes? They are in the air, for when the spores are quite ripe the pouches in which they grow open, and out fly the dry spores by the hundred; and as they are so very light and small they may float about a



MOULD.

- I. Bearing Spore-cases.
 II. One of the Spore-cases, still more magnified.

long time before alighting. So they are carried hither and thither by every motion of the air. Many of these spores never grow; for if they are in well-lighted and well-heated places they will come to nothing. Sunshine, which is so needful for our green-leaved flowering plants, keeps the moulds from growing; and this is a good thing too, for some kinds of moulds and many of their

relations are very troublesome to men and to some other animals.

The moulds are only one group of a large class of flowerless plants that are called "fungi." That is not a very hard word, and I wish you would remember it. The mildews and blights that often attack our gooseberry-bushes, grape-vines, and many other useful plants, and which cause the farmers and fruit-growers a great deal of bother and loss, are also fungi. Yeast, too, is a kind of fungus, — for fungus is what we call one of the fungi, — and so is the slimy, shapeless plant that is commonly called "mother," and which grows in our vinegar-jugs and barrels.

IV.

A WORD ABOUT TOADSTOOLS.

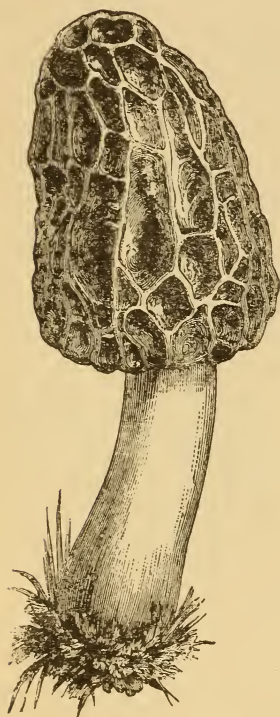
You all know these pretty little umbrellas that so quickly unfurl themselves on damp, shaded spots of ground after a warm rain. Some are brown, others white, and more of lovely dove colors or soft gray tints. I suppose you all call them toadstools. Some boys and girls think that



A CLUSTER OF TOADSTOOLS

they are called toadstools because toads build them for their own use. My young friend Jack told me that when he was a very little fellow he really believed that his playmates the brown toads sat under the toadstools to keep dry when it

rained and squatted on top of them when the sun shone. But I hardly need to tell you that toads



A MOREL.

have nothing whatever to do with these umbrella-shaped plants ; for each one is a plant that grows very fast in warm, damp weather. Did you ever eat mushrooms ; or, better still, did you ever go out into the shady green woods to gather them when the hot spring sun and warm showers make all plants grow ? Sometimes you find mushrooms growing in old orchards. They like the soft leaf-mould found under apple-trees. Mushrooms are plants much like toad-

stools. Some kinds of toadstools are poisonous to eat, but many other kinds are very nice for food. Here is a picture of one kind of mushroom that

is often eaten. Have you ever seen it growing? It is very pretty, of a lovely golden-brown color. It has a pretty name too. It is called the morel. In England, many ignorant people believe that the mushrooms that are gathered for food must be picked before sunrise or else they will hide under the ground and stay concealed till twilight. Is not this a silly notion?

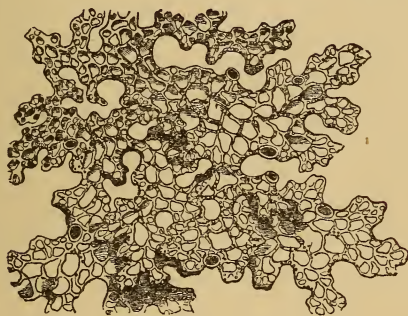
Did you ever, in walking in a field or by the roadside, stamp on a dry puff-ball, and as it broke in pieces see the dark dust fly up in a little cloud? Puff-balls, too, are plants really very much like toadstools and mushrooms, but of a different shape. Every little speck of the fine dust that children like to make fly out of the puff-ball may grow into a new one if it fall on moist, rich soil, and the weather be warm enough, for each of them is a spore. Puff-balls, mushrooms, and toadstools, as well as the moulds, all belong to the great class of plants called fungi.

V.

SOME OTHER FLOWERLESS PLANTS.

IF you live in the country, or if you go there in vacation to run about the fields and woods and grow strong in the sunshine, I think you must have noticed the soft little greenish-gray tufts that grow on old fences or fallen trees, or on decaying tree-stumps. We children, when I was a little girl, used to call these pretty tufts “whisker-moss,” — I suppose because they look somewhat like gray beard. They are not mosses, but belong to another group of plants called lichens, of which there are many hundreds of kinds in the world. Many of them are often incorrectly called mosses ; but they form an entirely different group of plants, though, like the mosses and toadstools, they do not bear flowers or real seeds, but grow from dust-like specks that you will remember are named spores. Lichens are so plentiful and of so many kinds that you cannot walk far,

where anything at all grows, without seeing more than one kind ; or if you do not see them, it is because your eyes do not serve you as they are able to do, for these quiet little flowerless plants are waiting all about you. The wrinkled discs and patches that spread themselves over rocks and stone walls are lichens. Some of them are very



A COMMON LICHEN.

thin, and cling closely to the surface of the stone, and are so nearly of the color of the rocks where they live that you may easily pass them by unnoticed ; others you can readily loosen from their hold on the rocks, particularly in wet weather. In spite of the dull tints of some kinds, there are many lovely colors to be seen in the lichens. There

are soft browns and grays, and whitish grays, and greens of many shades, and yellows and scarlets. The colors change very greatly as the air is moist or dry. Children who live in the city and cannot go at all times into the fields or woods to find lichens, in order to see them need only to look at the trunks of the large shade-trees along the streets or in the parks. On many of the old trees (unless they have been scraped by the city forester), the bark is sure to be of a more or less distinct yellow or dull orange color. Look closely at such trees and you will see that this is caused by a yellow lichen that dot by dot is creeping its way over the tree-trunk. There is much more of this lichen growth on the north side of the trees, because these flowerless plants like the shade and moisture. When a long gentle rain sets in, if you watch these yellow lichen-patches you will see them gradually change to a yellowish green and sometimes to a real green. They say that in old times the American Indians often guided themselves through the woods by noticing these tree-lichens, which, as they knew, grew thickest on the side facing north. One pretty kind of lichen that is very common

bears tiny pale green stalks tipped with bright red. They look like groups of green fairy-men wearing scarlet caps. But you must look for yourselves and see how many kinds of these plants you can find, and take them to your teacher, who will tell you more about them than there is room here for me to do.

Humming-birds gather the crinkly light-gray lichens and with them deftly cover the whole outside of their nests. This the cunning little builders do to protect their nests from the sight of enemies. One of the loveliest things I ever saw was one of these wee nests fastened to some twigs that were thickly grown with lichens of a color very like those with which the mother-bird had covered her nest.

Humming-birds are not the only animals that make use of the device of making their homes to resemble their surroundings so closely that they cannot be distinguished from them. More than this, very many animals and plants, too, have gradually come to mimic so exactly the objects among which they live that they are thus enabled to escape from their enemies. The animals, too, are in this way able to steal unobserved upon their prey.

There is a kind of eatable lichen that grows plentifully in far-away Iceland. The high plains



ICELAND MOSS.

and mountain-sides there are often quite overgrown with this lichen, which the Icelanders cook in milk and use in various ways for food.

In the season for gathering it the boys and girls of this north country

go on their ponies, with well-packed baskets of provisions, and camp out on the hillsides while they harvest the fields of lichens. The young folks look forward to this mountain-trip with great pleasure, for they have a merry time in this out-of-door life. The lichens are gathered and spread to dry, and then packed and loaded on the backs of the stout ponies to be carried home. Eatable lichens grow in many other parts of Europe, in the far north, and one kind is plentiful in the coldest parts of North America. Lichens are not very

important for human food, as they are tasteless, and not as nourishing as many other things ; but the hardy reindeer whose home is in the cold north-lands, at some seasons of the year lives almost wholly upon one kind of lichen. For this reason it is often called reindeer-moss.

“ Little lichen, fondly clinging
In the wild-wood to the tree ;
Covering all unseemly places,
Hiding all thy tender graces,
Ever dwelling in the shade,
Never seeing sunny glade.”

VI.

FROG-SPIT.

How many of you believe that frogs have anything to do with making the green scum commonly called "frog-spit," that is so often seen drifting on ponds? In parts of Canada the boys and girls call it "frogs' eggs." The big-eyed frogs hide under this green curtain, and sometimes you see one popping his head up through it and peeping out over the floating garden ; for you are to know that the so-called frog-spit is nothing more nor less than this. The green scum, whether it form a large patch or be scattered in little floating islands, is entirely made up of one kind or of several kinds of plants that grow only in fresh water. There are hundreds and hundreds of different kinds of plants that grow in the fresh water of pools, ponds, brooks, and rivers. The kinds that grow in one little body of water may be quite different from those found

in a neighboring one. The "frog-spit" that is often caught on the blade of an oar, when a boat is rowed through it, and that hangs down from the uplifted oar like a green veil, appears to the naked eye only a shapeless mass ; but lift a little of the soft stuff from the water and place it under a microscope and you will see a tangle of delicate tubes. Each tube is really composed of a row of cells placed end to end, thus making delicate circular partitions in the tube. A bright green pulp is seen through the thin walls of the threadlike plants ; for you will remember that each green thread is a separate plant. Sometimes this green material almost entirely fills the cells ; at other times it is arranged in a regular pattern ; in some of the commonest kinds of these plants it runs in a beautiful spiral coil throughout the whole length of each tube. The different kinds, or as the botanists call them, the species of these beautiful little water-plants, are partially known from one another by the way in which the green contents of the cells are arranged.

There are many other fresh-water plants very different from these thread-shaped ones. In many

species each plant consists of a single cell something like the yeast, but colored green or brown,

and not always roundish as the yeast-cell is.

One of the most interesting of these cell plants is that which botanists call by a long Latin name which means something like rolling globe. It is really a group or colony of very little plants, all bound together into a hollow globe, furnished with hundreds of little



SOME "FROG-SPIT"
(magnified).

hairs that act like oars and row it round and round, over and over, in the oddest imaginable way.

Charming little water arbors and gardens, not large enough for a minnow to swim about in, full of queer puzzles like this rolling household of plants, may be found clustered around the stem of any pickerel-weed, or pond lily ; but there is room here

to tell of but a very few of these fresh-water plants.

The diatoms, which form one class, are so very interesting that I must tell you just a word about them. A good many years ago I tried the experiment of tying some very fine muslin over the kitchen faucet. Our supply of water came from a great lake, and straining the water in this way would catch any wee water-plants that might be brought into the pipes with the lake-water. Leaving the water running a little all night, in the morning I found there was a thin layer of brownish slime on the muslin strainer. On scraping off this slime and looking at a speck of it through a microscope, one could see the little plants of which it was entirely made. The diatoms consist of single cells, of many different shapes, — some like a fan, some like a round pill-box, some like a boat, and so on. But they all are alike in one thing, that is, in having the beautifully marked and sculptured shell or coating of their cells made of a flinty substance like quartz-rock. These exquisite atoms of plants can be cleaned from any slime or earth that clings to them by boiling them with strong acids that will eat

away and dissolve everything but the little flinty skeletons of the separate cells. Those that are



DIATOMS.

shown in the picture have been cleaned in this way. Diatoms are found all over the world, growing in a greater variety of places perhaps than any other kind of living thing. They grow in all sorts of fresh water, and are even found living in hot springs where the water is nearly up to the boiling-point.

Quantities of the tiny things discolor for hundreds and even thousands of miles the great ice-fields of the polar regions. The oceans are alive with them, and great portions of the bed of the sea are covered with the skeletons of diatoms that have lived and died in its waters, and slowly sunk — perhaps for weeks or months — until they found a quiet resting-place at the bottom. Similar beds, of the kinds that live in fresh water, may now be forming at the bottom of any fresh-water pool.

There is another group of very beautiful one-celled plants called the desmids. They are like the diatoms in their mode of growing and in their habit of being always in motion. But the desmids differ from the diatoms in being without any flinty shell and in their color, which is a lovely bright green. These little green water-plants, that spend their whole lives in swimming about, like the diatoms, are of many pretty shapes. One very common form is like that of the new or crescent moon.

Some of the earlier explorers in the Arctic regions were much interested in the red snow that they found, in some places reaching for miles, in

beds many feet deep. It was at last found that this snow was colored red by multitudes of tiny one-celled plants that lived and grew in it. You may never see these wonderful rosy snow-banks, but almost the same kind of plant that colors them you may find in damp eaves-troughs, and in stagnant pools or in rain-water barrels. This common kind is sometimes red, but generally green. It is called the rain-water plant. Perhaps I ought to have told you before that all the plants which are described in this lesson produce spores from which new plants grow. One very curious and wonderful thing about this rain-water plant is that some of the little cells start out in life not as tiny



globes, like those of the yeast, but as little pear-shaped plants, each one with a pair of the tiniest hairs with which it constantly rows itself about through the water. You cannot imagine how small these little oar-hairs are.

TWO DESMIDS.



VII.

A GARDEN IN THE SEA.

IF you look on your map of the State of Maine you will see where the Atlantic ocean sweeps into the land between Maine and New Brunswick, making the deep, irregular bay called by the old Indian name Passamaquoddy. This bay has many arms that stretch into the coast making numerous smaller bays.

On a little island in one of these small bays I spent some time one summer camping out. It chanced to be a time when the ocean-tides rose very high and fell very low. At high tide the water ran far in on the island coast, and when the tide went out, ledges of rock, a sandy beach, and low flats were left uncovered for several hours. I often found on the beach, as the tide went out,

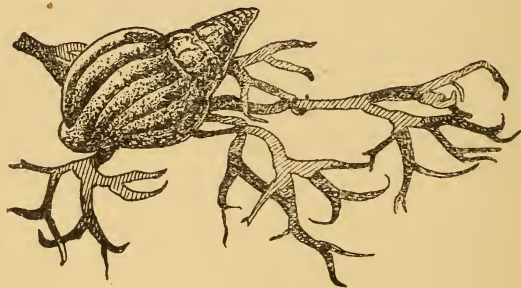
stray seaweeds torn by the waves from where they had grown on the sides of the rocks or from the sea-bottom near the island, but I longed to see these treasures growing.

So one morning, when the tide was quite low, we took a little flat-bottomed skiff that could float in the shoal water and slowly sailed around our island. In many places the water was not more than a foot deep, and as the air was very still one could see distinctly through the clear water not only all the living things but the very grains of yellow sand at the bottom. It was a real wonderland that I saw as I bent over the side of the boat and looked down into the shallow, sunlit water. There were clumps of orange sponges holding up their finger-like prongs, and shoals of spiny sea-urchins; and here and there a yellow star-fish was out for a morning stroll. Most of these sea-stars were quite small, only two or three inches across; but we saw a few great ones that actually measured nearly a foot from tip to tip. Then there were several sorts of fish sailing hither and thither, and the misshapen old flounders that lay close to the sandy bottom; for they well know that this is

the best way to hide from their enemies, since their color and markings are very like the sand on which they lie so motionless.

But I must tell you about the lovely garden in the salt water, and say no more about the interesting animals that were among the sea-plants. Sometimes the boat would for many yards creep over great beds of a kind of pale-green seaweed. This consists of waving leafy ribbons that look a little like some very delicate and beautifully colored kind of lettuce. Then there were ever so many kinds of dark brown and purplish and dull red and bright pink plants that are usually called sea-mosses. These delicate plants can be preserved almost perfectly by placing them in a basin of fresh water, slipping a sheet of paper under them as they float, and gently lifting them so as to drain off the water. After being pressed and dried on the paper they look like exquisite pictures painted in their natural colors, though some of them are not as bright as when growing in the water. Oh, I wish I could take every one of you little people out at low-tide, and with you see just such a sea-bed as that I sailed over for two or

three miles that summer morning. If all manner of jewels had been scattered over the sea-sands they could have shown no fairer colors than the greens, browns, ambers, purples, reds, and pinks of the indescribable things growing in masses in this lonely spot. Sometimes, clinging to a feathery bit of seaweed was a tiny shell, and within, all cuddled up, lay the little creature who lived there. Did n't he have a pretty home in his cunningly fashioned shell-house, nestled among the bright sea-mosses and always rocked by the lapping waves of the pure ocean-water?



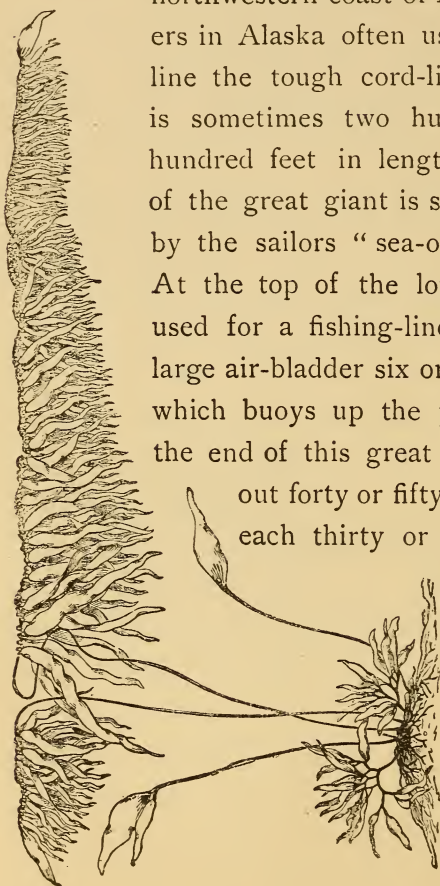
VIII.

SEA PLANTS

(CONTINUED.)

SEAWEEDS of one kind or another are found in all parts of the world where there is salt water. There are a great many kinds of seaweeds, and they vary in size, all the way from the pretty feathery "mosses" that I saw in the little bay in eastern Maine, and that are common all along our Atlantic coast, to great plants that are found in the south Pacific ocean, which sometimes grow a thousand or fifteen hundred feet in length. This is the longest plant in the world. Here is a picture of it. The long stem grows up from the clustering roots, which anchor the plant to the sea-bottom or to the rocks from which it grows. These roots are called the "hold-fast," because they cling so stoutly. It is kept afloat by many little bladders or air-vessels that grow among the numerous leaves at the upper end of the plant.

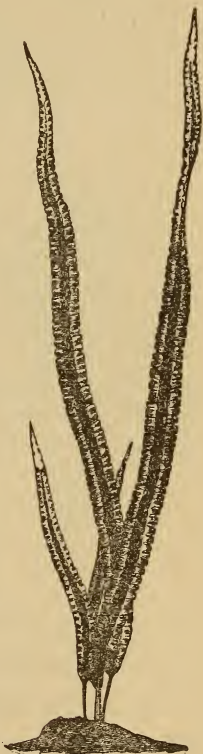
There is a relation of this giant seaweed which grows farther north. It is very plentiful along the northwestern coast of America. Fishers in Alaska often use for a fishing-line the tough cord-like stem, which is sometimes two hundred or three hundred feet in length. This cousin of the great giant is sometimes called by the sailors "sea-otter's cabbage." At the top of the long stem that is used for a fishing-line there grows a large air-bladder six or seven feet long which buoys up the plant, and from the end of this great air-vessel strike out forty or fifty immense leaves each thirty or forty feet long,



THE GREAT KELP
OF THE PACIFIC OCEAN.

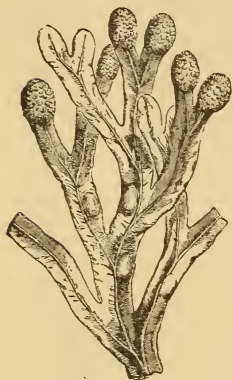
that float far out on the waves. The big furry sea-otter, that is found in the north Pacific ocean, likes to sport among these seaweeds, hiding between the great trailing leaves as he catches the fish upon which he lives; or when he is tired of fishing, and wants to rest or take a doze, he just climbs up on the big floating air-bladder, stretches himself out, and basks at his ease in the sunshine. This is why the funny name of "sea-otter's cabbage" is given to this seaweed.

Along our Atlantic coast and in many other waters there grow several much smaller relations of the great Pacific plants. They are called kelp. Most of the sea-plants grow either from the bed of the sea or from rocks along the coast. Those of you who live in eastern New England, or who have ever visited the seaside,



A KIND OF KELP.

must have seen, growing on the rocks in loose masses, a dark olive-green or brown seaweed full of little bladders. Perhaps you have picked from the sand bits that have been torn away by the breakers, and, after being tossed back and forth, at last have been dropped on the beach by the out-



ROCKWEED.

going tide. This is a rockweed, and is very common in many parts of the world. The rockweeds always grow on rocks that are covered by salt water at high tide but are left bare at low tide.

Other kinds of seaweeds always grow far enough from land never to be left uncovered by water, and there are others still that have their home in rather deep sea-water. But I think none that grow from the sea-bottom are ever found in water more than five hundred feet deep. Some of the most beautiful rose-colored and purple seaweeds are found in the deep waters. But besides the many varieties of plants, both great and small, that are fastened either to rocks

or to the bed of the sea, there is another kind, closely related to the common rockweed, that is not attached to anything, but grows floating. It is a more delicately formed plant than any of the rockweeds, with slender leaves, and its air-bladders are funny little round things not bigger than small pepper-corns. Great floating tracts of this seaweed form what are called the "sargasso seas." You have seen them marked on your maps of the southern oceans; the largest one is that east of the Bahama Islands, and this covers an immense space in the ocean, extending across the Atlantic nearly to the coast of Africa. There are many other smaller seas made by the gulf-weed, or sargassum, for that is the name of the plant which has spread itself over such large portions of the ocean-world.

Many of the seaweeds are of great use to man. Of some, certain medicines are made. Some of the coarser kinds are cast on shore in quantities, and these are used to fertilize the farm-lands. The rockweed, or bladder-wrack, as it is sometimes called, forms the chief food of horses, cattle, and sheep in some of the barren Scottish islands.

Young kelp is sometimes used as food by men, and the so-called Irish moss that is sold to make blanc-mange and custard is a kind of seaweed. Dried seaweeds, too, are burned as fuel in some places where wood is scarce. None of the seaweeds bear true seeds, but they all grow from spores.



GULF-WEED.

IX.

ROBIN-WHEAT.



ROBIN-WHEAT.

FAIRYLAND could never show any fields so dainty and lovely as those of a beautiful moss

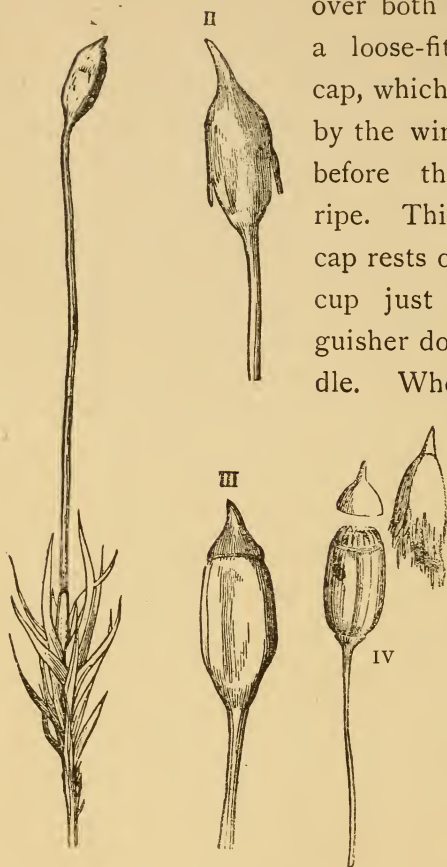
that the children in Northern Ohio call by the pretty name of "robin-wheat." If you do not know this particular kind imagine a cushion of rich red or sometimes green velvety moss from which rises a forest of tiny stalks, each as slender as a hair, and bearing at its top a little greenish pouch, somewhat drooping, that does not look unlike a kernel of grain. It is a pretty fancy of children that these mimic grain-fields belong to the robins and are harvested by them. And, no doubt, robins and other birds as well do help themselves to the small selfsown and unreaped harvests; for birds find out even better than do children anything that may be eaten among the things that grow about them.

The little tapering pouches, that look enough like grain-kernels to have given rise to the name "robin-wheat," are really spore-cases in which are borne the dust-like particles, so full of power to live and grow that from each one a new plant may arise. The mosses then, you see, are another group of plants that grow from spores instead of from seeds. By and by you may like to study these wonderful little spores with a microscope and

to compare them with seeds and to find out the real differences between a seed and a spore.

There are a good many kinds of moss that somewhat resemble the exquisite "robin-wheat." One kind that is very common in many parts of the world is sometimes called "pigeon-wheat," and in parts of New England it goes by the name of "bear's bread," and in other places "bear's bed," or sometimes simply "bear-moss." Its spore-cases are shaped like little urns or vases, and they do not droop, as do the purse-like pouches of the robin-wheat, but each one stands erect upon its stalk just as a goblet does upon its stem. From such a tiny cup the queen of the fairies might sip her honey-dew, but it would take the fruits of many a moss-tussock to make even a bite for old Mr. or Mrs. Bruin or even for one of their funny little cubs. So "bear's bread" doesn't seem to be a very suitable name for this moss; but that of "bear's bed" is not so bad, for if you have ever rested on one of the sweet, clean, springy beds made by this deep green moss you will agree with me that any bear might be glad of such a couch.

Each little urn or goblet is covered by a lid, and



BEAR'S-BED MOSS.

- I. The Moss with its Urn.
- II. An Urn with its cap.
- III. An Urn with cap removed.
- IV. An Urn with its cap and lid.

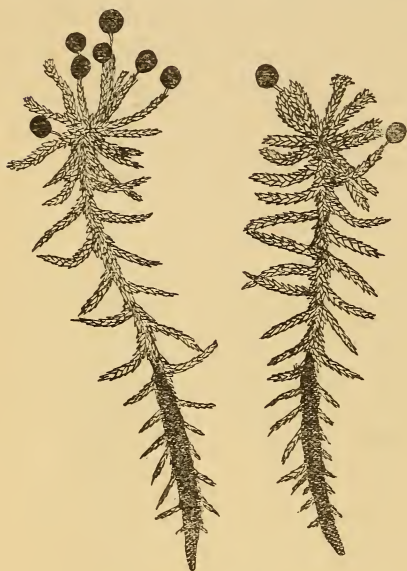
over both urn and lid is a loose-fitting, pointed cap, which is blown away by the winds some time before the spores are ripe. This light, fringed cap rests over the spore-cup just as an extinguisher does over a candle. When the spores

are quite ripe, the neatly fitting lid of the cup or case opens, that they may escape and fly out to make new moss-beds. Try to find some of these moss spore-cups and see for

yourselves how beautifully and carefully Nature protects the young spores until they are ready to grow. But the moment the little things are free, they trust themselves to the wind, and there is no telling how far they may be carried before they are dropped. A whiff of the powdery spores may be borne by a strong wind to some volcanic island that is nothing but a mass of barren rock, and soon a soft green carpet begins to spread over the desolate place. The mosses require but little soil, and therefore they can take root in the little deposit of dust and finely crumbled rock that gathers after a time even on the naked surface of a volcanic island. These first mosses would not be the large kinds like the "bear's bed," but some of the fine creeping ones, such as you have all seen growing between the cracks in a brick pavement. Lichens, too, are among the very first living things to grow on bare rocks. They and mosses are both fitted to make a beginning in such spots, not only because they can flourish in a scanty soil, but also because their spores are so very fine and light that the wind can carry them long distances over the land and the sea.

Together these modest plants gradually form a covering for the bare rocks, and as they decay they at last help to form a soil in which larger plants can grow.

Mosses are found in nearly all parts of the world, but they grow best where it is rather damp.



ONE KIND OF BOG-MOSS.

Where the air is too dry they cannot flourish at all. They are very old plants, — that is, they grew on the earth abundantly long before it contained ordinary flowering plants. In the colder parts of America and of Europe mosses grow very abundantly in some

bogs and marshes. After a time large coarse grasses, rushes, and some kinds of bushes spring up among the bog-moss. Year after year, as all

these plants drop their dead leaves or die and fall down into the bog, they form great beds of peat. This peat looks like brown earth, but it is really made of partly decayed moss, and leaves, and wood. It burns well when it is dry, and in Ireland and some other parts of Europe many people have no other fires to keep them warm or with which to do their cooking but those which they make of dried peat, or "turf," as it is often called.

X.

FERNS.



A FERN.

THE beautiful green ferns, whose waving leaves you have often gathered with your own hands, are another group of plants that neither blossom nor bear seeds, but grow from spores. Have you ever noticed the pretty little brown spots on the under side of the fern leaves? Sometimes they

are tiny roundish dots scattered in patterns along the under part of the leaf or frond, — for frond is the name given to the leaf of the graceful ferns. As it is the name botanists use, and is not hard, suppose *we* say frond. In some kinds of ferns, instead of scattered dots you find the markings of a different shape, often along the scalloped edges of the frond. If you look for these markings in early spring, you will not find them; but a little later you will see faint light-green spots appearing, and later still these grow brown. These spots are the fruit of the fern; that is, they are little cases that bear the spores from which new plants will arise. When the spores are ripe, the little cases, in which they have grown, open, and then the fine spore-dust falls out and is carried here and there by every breeze. It may be that when you have gathered ferns in midsummer you have seen a brown powder sift over your hands. This was a shower of the ripened spores, shaken out as you pulled the fronds.

There is a very old saying that if fern-seed fall upon you it will make you invisible, — that is, in some magic way hide you from sight. By fern-seed

the spores must be meant, as ferns do not have real seeds. It would be so easy for people to find out that there is no sense or truth in the saying; and yet do you know that many of the peasants in Russia and in some other countries still believe this queer fancy?

There are a great many kinds of ferns, and they



BRAZILIAN TREE-FERNS.

grow in almost all parts of the world, except where the soil and air are very dry. You know that with us they grow most plentifully in damp, shaded places. In the Sandwich Islands and in some other countries, where the climate is very moist and mild, there are tree-ferns which grow

twenty, thirty, and even forty feet high. Ages ago, ever so long before men lived upon the earth, there was a time when ferns were very abundant, and many of them grew so large as to form part of the forests of those days. We know about those fern-trees and other strange trees of that time because in the coal-beds and in the layers of rock found between the layers of coal there are to-day found perfect impressions of their leaves and bark ; and now and then the exact shape of a beautiful leaf has been kept, as the mud or sand about it hardened into rock, or the decaying pulp of wood and leaves in which it lay was pressed and baked into coal, deep down beneath the surface of the earth.

XI.

THE WALKING-FERN.

DID you ever see or hear of a lovely fern that is named the walking-fern? Now, you must not think that this little plant really steps over the ground like a cat or hops like a toad, but it grows in an odd little way of its own that has given it the name of the walking-fern. I think when you come to know the way in which it grows you will agree with me that this is a good name. The walking-fern is very particular where it lives, and so I am afraid that most of you will not be able to find it growing in your neighborhood. It likes to make its home on limestone rocks, and in such places it grows in various parts of the United States.

I once lived near a beautiful glen in southern Ohio. Along the bottom of the glen flowed a large brook, and some way back from the winding stream, on either side, rose limestone cliffs. These cliffs, you see, formed the sides of the glen. This was a

wonderful place, in which grew a great many kinds of forest-trees, shrubs, and in their due season there blossomed a multitude of wild flowers. As soon as the bluebirds began to sing that spring was at hand, all along the rocks and banks many kinds of ferns began to put up their heads and to unroll themselves from the winter's sleep, in which they had been curled up under the brown earth to keep out of Jack Frost's way. The wild columbine danced along the very edge of the steep gray cliffs or swung out its yellow and red bells from crannies in the rocks. The star of the scarlet "fire-pink" blazed here and there among the greenery. Then there was the spring-beauty, the wind-flower, the crowfoot, the pink geranium, and the snowy wake-robin, and wild ginger, and wild roses, and ever so many kinds of violets, and scores and scores of other sweet growing things; and the borders of the brook were all green with water-cress, which the boys and girls used to gather and eat with their bread and butter.



A FERN UNROLLING.

Among the wonders of the glen was found the little walking-fern. It often grew in mossy patches, part way up the rocky walls of the glen. The frond of this fern is not cut, as are the fronds of most ferns, but looks more like the leaf of some flowering plant. Here is a picture of a frond of the walking-fern that will show you its shape and size.



LEAF OF WALKING-FERN (natural size).

The spore-cases grow on its under side, as in other ferns. Now about its name. The leaves, as you see in the picture, taper to a slender point. From the tips of many of the graceful leaves little roots grow down into the earth, fastening the end of the leaf to the ground, as you may see in the picture. From these roots spring up new leaves, making a new plant. Then if a leaf of this second fern sends out roots there is a third plant, and so



THE WALKING-FERN.

on. You may have seen the long trailing shoots of the raspberry or of the blackberry take root at their tips in a similar way. Sometimes one will find a little village of the walking-ferns, more or less joined together by their rooted leaves. They form a sort of natural chain of the loose rosettes made of the pretty pointed leaves.

XII.

A PLANT IN ARMOR.

I REMEMBER an odd-looking plant that when I was a child I liked to watch. Its name is the prickly pear. Here is a picture of it. Perhaps you have seen it growing. Our prickly pear was planted in a wooden box filled with earth. In cold weather the box was carried into the warm cellar to keep our queer plant from freezing; but as soon as the



BRANCH OF A PRICKLY PEAR.

spring frosts were over with, it was carried into the garden and placed in a sunny spot, at the head of one of our flower-beds. The whole plant, as you can see by the picture, is made up of flattened oval joints that people sometimes incorrectly call leaves. A neighbor gave my mother one of these fleshy

joints, and this was half buried in the earth in the box. In due time tiny new joints grew out



A GREAT MEXICAN PRICKLY PEAR

of the one we had planted, and when the new ones grew large, others sprang from them, and so on until the stiff, bristling creature sprawled all over the whole top of the box and even tumbled over its sides. In time the prickly pear bore large primrose-yellow flowers. I

said it was a bristling creature, and you will say so too if you ever try to pluck one of the blossoms

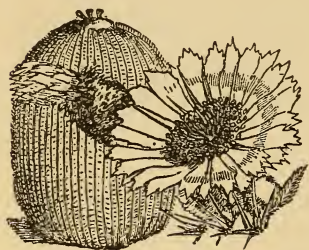
or break off a joint; for here and there over the whole plant grow little bunches of stiff short hairs or bristles. These are so sharp and fine that they easily stick into the skin of one's hand, where they cause a good deal of smarting.

The prickly pear belongs to a group of plants called the cactus family. Botanists already know more than five hundred kinds of cacti, and others will probably be discovered in out-of-the-way places. Their native home is in the warm dry parts of North and South America. The prickly pear is hardier than most of the cactus tribe, and it has straggled northward as far as the quaint old island of Nantucket, where it is found growing wild. The prickly pear where it flourishes best, like many of its relations, bears a juicy fruit that is good to eat.

On one kind of prickly pear that grows in various tropical countries live multitudes of tiny little bugs. These are the cochineal insects, from which, when killed and dried, is made a beautiful red dye that is much used to color woollen yarns and cloth. Perhaps the very red mittens you wear in cold weather were so colored.

The cacti are a queer-looking set of fellows.

They are generally of odd, awkward shapes, have no leaves, but are well armed with stinging hairs, or prickles. Many of them bear large gay flowers. Some of these are white, some yellow, others pink, and many bright red. Some of the cacti consist



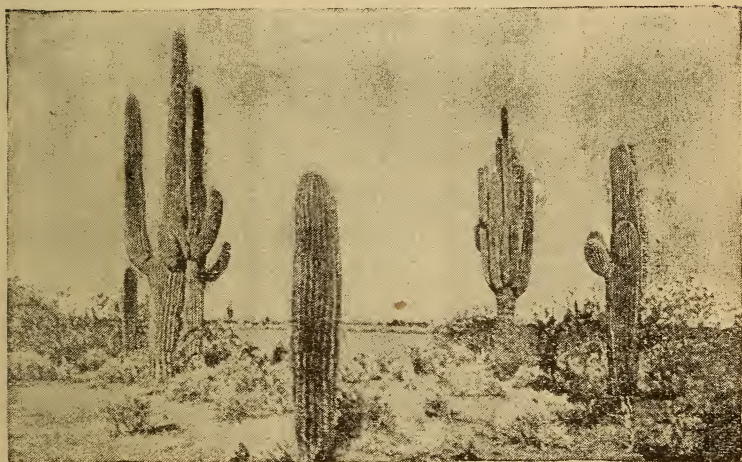
A MELON-CACTUS
(much reduced in size)
WITH ITS FLOWER BESIDE IT.

of a single thick round stem, shaped somewhat like a melon, and for this reason they are called the "melon-cacti." A cactus something like one of these, found in Mexico, was nine feet high, and weighed a ton. This

plant-monster was dug up and carried across the ocean to some great gardens near London; but he did not like being transplanted, and pined for the old wild home in the hot sandy soil of Mexico until he died.

The fleshy stems of many kinds of cactus contain a cooling juice that both men and animals relish. The herds of mules, pasturing on the dry plains of South America, where there are great tracts of cactus growths, would often suffer from

thirst were it not for the juice of the melon-cactus. How do you think the mule can get at the drink he wants without pricking his velvet nose? I suppose you would slice off the jagged coat with a big knife; but, as you know, the mule cannot do this. Instead, he paws off the spines with the hoof of



SOME TREE-CACTI.

one fore-foot and then sucks the refreshing juice. Sometimes the sharp prickles get into the tough cushion inside of the under part of his hoof and cause him much pain.

• In some places there are real forests of tall cacti, some kinds growing into trees fifty or sixty feet high, and the stems becoming so hard and woody that they are cut down and used as we use the wood of our forest-trees.

With all their bright blossoms, we cannot love the misshapen cacti as we do the sweet lady's-delights of old gardens or even the brave little chickweed that creeps over every bit of waste ground it can find. But when you come to know that their uncanny forms and lack of leaves, and even their ugly prickles, are all to help these plants to live in desert lands, where most plants would die, you will like to know more about them. But you must wait for all this long story until you are older.

XIII.

THE LINEN PLANT.

WHEN I was a little girl I had a flower-bed of my own where grew a good many different kinds of plants. I liked to plant strange seeds and see what would come up. One day I saw some smooth, shiny, brown flax-seed, and asked for a little to sow in my flower-bed. In due time some plantlets came up in the spot where I had covered the flax-seed with earth, and in a little while I had several thrifty, slender stalks of flax. My father noticed them one day, and told me that he wished I could see a whole field of flax. He said, "I know of no prettier sight than a flax-field in full bloom." Then he told me of the blue color of the flowers and of the use made of the stalks. After that, I eagerly waited for my few plants to bloom. By and by I saw some buds among the leaves, and one bright morning, when I went to the garden, there was one sky-blue flower wide open. Others

followed, and I had great pleasure in tending and watching my garden flax. But I often thought of what my father had told me, and longed to see a great field covered with the lovely blue blossoms.

At last it came about that I was to go with my father to make a visit at the home of some friends living several miles in the country. We were to drive in an open buggy, and as the road led, most of the way, through woods and thinly settled farm-lands, it was a beautiful ride. We started very early one sunny June morning. I asked a great many questions about the different birds we saw and heard, the various crops growing in the fields; and when we stopped to let old George, the horse, rest in some shady bit of woods, my father taught me to know the forest trees about us. We were near the end of our pleasant journey, when all at once I saw, on one side of the road, something that made me start and cry out with joy, "Oh, see there! What is that? Is it flax?" For there before my eyes was a broad level field of something as blue as the June sky above us. I was told that this was really flax in bloom. As the gentle summer wind softly blew over it, tossing

ever so lightly the masses of delicate flowers borne so gracefully on the slight stems, I thought I had never in all my life seen anything so beautiful. All I had dreamed of the beauty of a flax-field was more than realized. A single flower is very lovely both in shape and color, but acres of plants must be seen to give the full effect of their beauty.

An old name for flax, still often used in Scotland, is "lint." A pretty Scotch verse says, "When the lint is in the bell." The bright flowers are somewhat bell-shaped, and the poet means when the flax is full of its swaying bell-flowers.

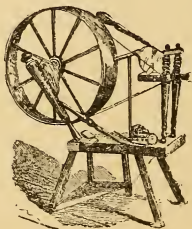
Flax has been cultivated for thousands of years to make linen thread and cloth. When at the right age, the plants are pulled and laid on the ground in neat bunches. After dry-



A FLAX-BLOSSOM.

ing, the flax is stripped of its seeds and soaked in water until it partly decays; but the tough fibres of which linen is made do not decay, but only grow soft and pliable. Then the softened flax is beaten and cleansed in various ways, and is combed out straight and smooth with metal combs. Finally it is spun into thread on the pretty little spinning-wheels such as our grandmothers used.¹ You have perhaps seen such wheels in old attics, or possibly in a parlor or hall, for ladies now like them as ornaments. All our fine table-cloths and napkins and many other useful articles are made of the linen thread by weaving it into cloth.

¹ The different kinds of linen cloth of commerce are generally made not from flax spun on the pretty old-fashioned wheel, but from that spun by machinery in great factories. In many parts of northern Europe, in Great Britain, and even in a few out-of-the-way portions of our own country, however, this charming old handicraft of spinning with the little flax-wheel is still carried on.



XIV.

SUMMARY.

It seems as though we had now talked a little about a good many kinds of plants, does n't it? But really we have only spoken of some of the great classes into which botanists have divided the plant-world. Each one of these large classes contains many — some more, some less — sub-classes, and each of these smaller divisions often contains more kinds of plants than you can imagine. Beginning with the speck of a yeast-plant, so tiny that your eyes cannot see a single one of the little living things without the help of a microscope, we have come on, taking just a peep at the moulds, toadstools, lichens, and the lovely and strange plants growing both in fresh and in salt water, to the dear robin-wheat and its kind, and the beautiful fern-tribe, all of which grow without either blooming or bearing seeds. The

tiny yeast-plant was the simplest of all, you remember, being nothing but a soft little cell which we know to be alive because it can give rise to others like itself. The yeast and many others of the flowerless plants may seem but little like the things which you have all your lives been accustomed to call plants. For those which you have always known by that name grow from seeds, have roots and stems, and usually branches and leaves, and bear flowers that ripen seeds; but the bothersome moulds that creep over your boots and over stale bread, as well as all the toadstools, and the lichens that soften and beautify the hard rocks and old stumps and fences, the green "frog-spit" of pools, the seaweeds of the ocean, and the green ferns with their embroidery of tiny spore-cases are just as much living plants as is the prickly pear with its gay flowers or the graceful flax, laden with its skyey bells.

I hope you will notice every one of the flowerless plants that comes in your way, whether it be a smart little toadstool or some spreading lichen or green moss or fern, and find out all you can about them and their ways of life. But

as the whole story of how plants support themselves and grow would be rather hard for you now to follow, we will for the present talk over a little some easier things about flowering plants, with which you are already somewhat familiar.

It would be a good thing if we could sow seeds and study their changes from the day they are buried in the damp earth until the plants that grow from them have perfected new seeds ; and this you will all do, I hope, when you study botany. But in these little talks it seems best only to call your attention to things that you can all easily see for yourselves in your play or walks. So, leaving the wonderful story of how baby plants rise from seeds, and how plants eat, drink, breathe, move, climb, swim, sleep, wake up, and gradually change their colors or their dress, and even put on armor as a defence against enemies, and set traps to catch their prey, — for all these things and more are done by plant-people, — let us try to see how a flower is made up, and how it perfects its seeds, and notice some of the contrivances by which Nature scatters ripened seeds over the wild woods and pastures.

XV.

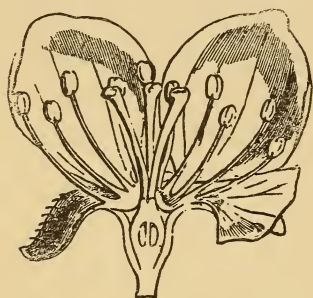
THE PARTS OF THE FLOWER.

EACH year that you have lived, you have seen the buds on the apple-trees swell in the gentle spring rain and the warm sun, and at last burst out into full bloom; you have smelled the sweet fragrance and seen the apples growing, that come after the flowers: and yet I think if you will now gather a few blossoms and find what I point out, you will see some new and interesting things about this common flower. A little girl once asked me if it were not wicked to gather these beautiful blossoms, as each one, if left on the tree, would grow into an apple before September. This was a very nice, kind thought; but Nature is so generous in all she does, children, that she has her plants bear a great many more flowers than could possibly mature into seed or fruit. In this way Nature provides for accidents. So we need not hesitate to take as many of the

abundant apple-blossoms as we like, to study. I should not idly pluck them, or any flowers, because, unless gathered for some useful purpose, they had, it seems to me, better be allowed to end their little lives uninterrupted.

Before we talk over the parts of the flower, can you tell me what is the use of the apple-blossom? "To make apples grow," I think I hear you say. If you look in the middle of a ripe apple, what do you always find? "Seeds," you will tell me. Yes, the seeds; and from these seeds, if planted in the earth, will grow little apple-trees. Then you must remember that the real use or work of the flower of any plant is to make seeds. Now please turn your apple-blossom upside down, and you will see a little hard, berry-like thing at the end of the stem; and this ends, you see, in five small points, which act as a tiny bouquet-holder for the rest of the flower. This outside part of the flower is called the *calyx*. The five little points are called the *calyx teeth*. In many flowers, as in the flax, the calyx is made up of several separate leaf-like parts that are called *sepals*; but in others the

sepals are more or less grown together. In the apple they are grown together more than half-way; in the trumpet-creeper they are much more united into one piece, making a vase or cup for the flower, while in the strawberry the sepals are separate until very near the base, where they unite.



AN APPLE-BLOSSOM WITH
ONE SIDE CUT AWAY.

Now, what do we find just within the calyx? I fancy I see ever so many fingers touching the five pinkish-white, shell-shaped parts which you often call "leaves." You must remember that these are called

petals. The petals of a flower are together called the *corolla*. Corolla means a little crown. If you cannot always remember the name "corolla," I am quite sure that you can remember that its separate parts are the petals. In some flowers these grow together, making what is known as a one-petaled flower.

When the sepals grow together, making one piece for the calyx, the flower is said to be one-

sepaled. The flower of the scarlet honeysuckle and the larger ones of the trumpet-creeper are good examples of one-petaled blossoms. You all know plenty more, such as the morning-glory, the foxglove, and the harebell. If you look at one of the gorgeous flowers of the trumpet-creeper, you will see that the margin is cut into five scallops. These tell how many separate petals there would have been if they had not grown together to make the gay, trumpet-shaped blossom.



A ONE-PETALED FLOWER.

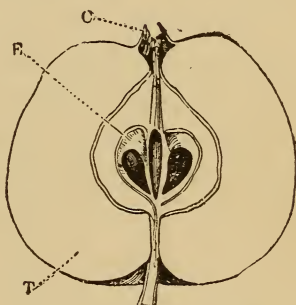
I wonder if you have ever thought why some flowers are so gayly colored? Many people imagine that this show of color is just for the sake of pleasing human beings; but you may be sure that the bright color and also the sweet scent of a flower are of use to the plant, else they would not be there. Pretty soon we shall see what this use is.

Now look inside the petals of your apple-blossom and you will see a number of tiny greenish stalks, each one bearing at its tip a little yellow ball. If you strike your flower against a pane of glass or on your sleeve, a yellow dust will be left. These little people with yellow heads are called *stamens*, and the dust or powder which they shed is *pollen*. The pollen of some flowers is not yellow, — as you will find if you smell of a tiger-lily and get your nose dabbled with its brown pollen.

Once more turn to your apple-blossom; look down in the midst of the stamens and see if you do not find five little things standing close together. If you were to examine with a magnifying-glass these small stalks which do not have the yellow tops, you would find that they are joined together at the bottom. This part of a flower is called the *pistil*. Some flowers have a pistil with just one stalk, while others, like the apple-blossom, have what you may call a compound pistil, because it is made of several parts, more or less joined together. If we were to split each of these parts of the pistil carefully from top to bottom, on looking at them through a magnifying-

glass we should find a little cell at the bottom of each. So that the whole lower part of this compound pistil is like a tiny house with five rooms, all of just the same size; and in each little cell or room are two very, very little objects which by-and-by will grow and ripen into seeds.

If we cut an apple crosswise through its middle, the five seed-cells can be seen, making a star. Each part of the star is one cell, and if the apple is cut straight through, the brown, ripened seeds within the cells will also



AN APPLE CUT LENGTHWISE.

- C Remains of the calyx-teeth.
- E One seed-cell.
- T Thickened base of the calyx.

be cut in two. Then, in a ripe apple, we have the lower part of the pistil and the calyx of an apple-blossom of last spring grown together. They are greatly enlarged since the flowering days, for they grew all the long summer through. The five little calyx-teeth do not grow. But look on an apple opposite the stem, and you will easily find the little, dried-up, leaf-like points still clinging to

the calyx, which has grown from the small green, berry-like thing into a large juicy, fragrant apple.¹ The lower part of the pistil, that contains the seeds, is called by botanists the *ovary*. The word ovary comes from a Latin word which means "a place where eggs are kept." The early botanists probably chose this name for the seed-box of a plant because eggs and seeds are a good deal alike; that is, a plant grows from a seed, just as a fish, a turtle, or a bird grows from an egg.

Not all flowers contain the various parts that you find in the apple-blossom. In many the petals are wanting, and in that case the calyx is generally bright colored instead of green. But in some flowers we find neither calyx nor corolla. In many plants the stamens and pistils are found in separate flowers; that is, some of the flowers will contain the pollen-bearing stamens, while others will bear the pistils, but have no stamens. A blossom that is made up of calyx, corolla, stamens, and pistils is said to be a *complete* flower.

¹ Sometimes the withered remnants of the upper part of the pistils can also be found inside the calyx-teeth.

XVI.

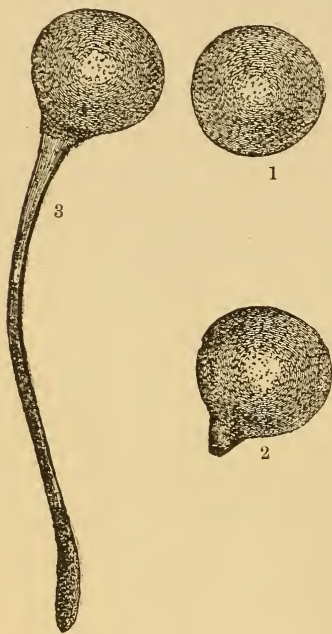
HOW SEEDS ARE PERFECTED.

THE stamen-dust or pollen has a use of its own. Unless some of this were to fall on top of the pistil or pistils, the baby-seeds, growing down in their little rooms, would never come to be perfect seeds that could grow and make new plants. When any of the pollen chances to fall upon the pistil, for some reason — which no one, however wise, can tell us — a sort of thread, so fine that you can scarcely imagine it, grows out of each little grain of pollen, and creeps down through the pistil-stalk to where the young seeds are, and in some way makes them able to become perfect seeds. If you ask me how and why, I must tell you I do not know how all this can come about. It is one of Nature's secrets.

The stalk of a pistil is called the *style*; the enlarged tip of the style is the *stigma*. In many flowers there is no style, or pistil-stalk; but the

stigma, which is usually rough, and often somewhat moist, rests on the ovary or seed-case.

One strange thing people have found out, and



1. A POLLEN-GRAIN, greatly magnified.
2. Same, beginning to send out a tube.
3. Same, with a long tube.

that is, that the pollen-dust from the stamens of any flower does not, as a rule, answer well on the stamens of that very flower, but pollen from another flower is better ; and the best of all is that which even comes from another tree or plant of the same kind. Now how is the pollen from one flower to get to the pistils of other flowers, even to flowers growing on separate plants? The small grains of pollen have no feet with which to walk and no wings

with which to fly, and yet they do travel about

just as is necessary in order to make seeds which will produce new plants. Let us try to discover how this comes to pass. I think you will say that it is as interesting as a fairy tale.

Seeds that when sown will sprout and produce new plants are said to be *fertile*; so the work of carrying the pollen from the stamens of one flower to the pistils of another is called *fertilization*. Many flowers bear pollen so dry and powdery that when the stamens are ripe enough to shed their precious dust it is easily blown about by the wind, just as are the spores of the moulds, mushrooms, ferns, and other flowerless plants. Those of you who live where pines and other evergreen-trees grow, may have seen, in blooming-time, showers of their pollen carried along by the wind. Go into a field of Indian corn when it is in flower, or as the farmers say, has tasselled, when there is a good breeze, and you can see the light pollen drifting about in the air. Such plants have no trouble in sending their pollen far and wide. Wind-fertilized plants, too, almost always have their stigmas branched, plumed, feathery, or of some shape and kind well fitted to catch, as they settle, the parti-

cles of pollen floating in the air. Most of the grains and grasses, the hazels, alders, and many



WIND-FERTILIZED
PISTIL OF WHEAT.

other plants which you can easily observe, are fertilized by the wind, and their stigmas are fashioned so as to help on the useful work.

One of the most beautiful adaptations of this kind is to be seen in the silk of corn. You have all seen the blossoms of the Indian corn, away up at the top of the stalk; and you have also seen the silk that is inside the corn-husks. The silk, you know, always hangs out a little way in a tassel at the end of the ear of corn. Will you not say that it is wonderful, when I tell you that every thread of the soft, pretty corn-silk is the stalk or style of a pistil? These pistils purposely fall outside the green husks in order that their stigmas may catch the pollen, which the wind carries from the stamens, which are found in the blossoms that are borne so far above the pistils. Each speck of pollen, after falling upon the stigma of a strand of the corn-silk, must send its threadlike tube

all the way down through the length of the silk to the little one-celled ovary at its base. This ovary is what we call the young kernel of corn. If the pollen fails to alight on a single stigma at the outer end of a thread of corn-silk, the tiny kernel for that thread will wither and dry up, so as to make what the farmers call a "deaf" kernel, such as we see scattered here and there through an ear of corn.

I want you to be sure to notice that the ever-green trees, the grains, grasses, sedges, and other wind-fertilized plants have small blossoms, usually green or brown, which without careful observation you would scarcely know to be flowers. In general, these plants have no trouble in sending their dry pollen-dust far and wide by the wind; but the pollen-grains in the blossoms of many classes of plants are more or less sticky. The wind could not easily catch and carry such damp, clinging particles. Then too there are other flowers that have taken such shapes that their stamens are shut away from the wind. In many of these flowers whose pollen the wind may not scatter, the stamens do not shed their pollen at the same time that the

pistils are ready to receive it ; and again the stamens and pistils are borne in separate flowers, or even on separate plants. Besides, as I told you, many flowers cannot perfect their seeds unless pollen be brought to the pistils from the stamens of other flowers. But Nature has arranged for this necessary work of carrying pollen from flower to flower, or from plant to plant, in the most curious and interesting way.

XVII.

HOW FLOWERS HIRE THEIR POLLEN CARRIED.

WHAT are the bees and wasps and butterflies so busy about, as they fly among fruit-trees in full bloom, or above the garden flower-beds, or over the clover-fields? "Gathering honey," you will say, and that is true, as far as it goes; but these pretty flying travellers are doing more than merely feasting and lading themselves with honey, as you call it, to bear home. The correct name for the sweet liquid found in many flowers is *nectar*, and the part of the flower that secretes and holds the nectar is called the *nectary*. The bee sucks the nectar, swallows it into his crop, where it is somewhat changed, then pumps it up, empties it into the cells of the honey-comb, — and this is really honey.

I wonder if you know in what part of a flower the nectar usually is kept? I am pretty sure that

you as well as insects know where to find it in the red clover, in the sweet locust-flowers, and in the curving spurs of the columbine; for children generally are fond of sucking the nectar from these flowers. It is the base or lower part of each slen-



der clover-blossom that must be nipped off to get at the dainty droplet which it contains. Now bees and other honey or nectar gathering insects have had long experience at this work, and know very well where to find what they seek. As a bee makes his way down into a flower to sip its nectar, must he not push his head and shoulders against the stamens and pistils? If the pollen be ripe, some of the grains shaken from the stamens will pretty certainly stick to the bee, particularly if he wears a velvet coat. Suppose a bee or other insect to get well powdered with pollen, in his visit to a flower, do you see what will happen as he dips down into another blossom? As he brushes

against its pistils, very likely some of the tiny grains of pollen on his head or body will be dislodged, and if ever so little fall on the pistil of the second flower, a useful work has been done; for in this way the seeds growing down in the ovary will be made fertile. How useful to flowers the bees, butterflies, and many other insects are! When Jack learned how pollen is carried about by insects, he said he thought we might call them Nature's little foot-pages, because they do her errands for her.

Of course the pollen of one flower would do no good if dropped upon the pistils of a different kind of flower, but very often many plants of the same kind grow near together; and besides, bees and butterflies prefer to visit only one particular kind of plant at a time. Then, too, not all nectar-bearing plants yield their delicate food to every insect that comes along. Certain plants hide the nectar in a deep cup or spur, quite out of reach of all insects except special ones that are particularly adapted to secure the nectar of these very plants. Bees not only seek nectar, but pollen also, which they gather and tuck away in little shallow pockets on their hind

legs. The golden pollen-dust is taken to the hive or nest, emptied out of the curious pockets, and mixed by the bees with honey into a soft brown paste. This queer-flavored mixture is packed away in cells and kept as food, particularly for the young bees. It is called bee-bread. Just here let me tell you that the very flowers which bear nectar, or honey, as you call it, are the ones which are sweet-smelling, or which have bright-colored petals, — sometimes are both sweet and gay-colored.

Now can you guess the use of the showy banners hung out by so many plants? They are signals to say to insects, "Honey is here; honey is here! Come and sip it; come and sip it! I'll give you sweet nectar if you'll carry my pollen to my neighbors and fetch theirs to me." And right glad are the little nectar-loving creatures to take advantage of the offer of the flowers; and the flowers, too, may thank the bearers of their pollen-freight, for without this help many species would soon die out. In some countries the red clover sets no seeds, because there are no bumble-bees. The proboscis of the hive-bee is not long enough to reach the nectar, and therefore they do not visit

these flowers. In parts of Central America the same thing is said to be true, and for the same reason, of the scarlet runner, the beautiful flowering bean that is common in yards and gardens. So if there were no bumble-bees in any part of the world both the red clover and the scarlet runner would die for lack of fertile seeds to keep up the stock.

I am very sorry to have to tell you that there are some rogues among bees which do not pay for their nectar. Such nectar-thieves bite holes through the lower part of the flower into the nectary and steal what they wish, instead of going, as they should do, to the open flower and sucking up the nectar, then paying for it by carrying pollen to other blossoms. This is a very mean thing for bumble-bees or for any insect to do; for there is an old bargain between flowering plants and certain little animals that the former shall give their nectar to the latter as payment for bearing their pollen. For thousands and thousands of years before men lived on the earth this traffic was going on, wherever there were flowering plants and insects. And it is to this long-standing commerce that we

owe the lilies, sweet-peas, and larkspurs of our flower borders; the snow-white flowers of the buckwheat, and the delicate blue ones of the flax, that cover cultivated fields; the velvet mulleins and brave old thistles, all bristling with armor, of our roadsides; the daisies and buttercups and violets that bedeck the meadows and pastures; the geraniums and orchids of the woods; the blazing cardinal-flowers and spice-scented azaleas of low lands; the wild roses and laurels of hillsides and mountain lands; and the multitudes of beautiful blooming things that make the world lovely, and that load the air with fragrance.

Flowers not only hail passing insects by sending out fragrant odors and fluttering gay petals or sepals, as the case may be, but many of them have distinct markings that guide the insect-visitors directly to the nectary. You have all seen many flowers whose corolla is marked with dots, lines, or circles of a different color. Flowers that only open after twilight, and whose seeds are fertilized by night-moths, do not have the *pathfinders*, as we call the lines or color-spots that point the way to the nectar; but look at your

nasturtiums, pansies, hollyhocks, sweet-williams, and oxalis, and you will easily find the insect-guides.

In many blossoms with irregularly shaped corollas, such as the large ones of the foxglove and the catalpa, or the small blue ones of the ground-ivy, and of most of the mint tribe, the lower lip is beautifully marked with bright dots, lines, or mottlings. It is on this lower lip, or "doorstep," as some one has called it, that the nectar or pollen seeker alights before entering the throat of the flower, and where he pauses as he comes out to brush off some of the pollen, and, maybe, to fill his pollen baskets, before flitting away.



XVIII.

SOME POLLEN-CARRIERS.

I HAVE just told you something about how flowers hire some insects to work for them ; but perhaps you want to know just what insects these are that carry pollen for flowers. Well, there are other animals besides insects at work for flowers. Snails, creeping about from plant to plant, sometimes take a little pollen along with them as they go, and so help in fertilizing seeds. The humming-birds, so lovely on account of their shimmering play of colors, as they dart from one flower to another, and poise themselves for a moment in front of each, while they dip their slender bills down into the nectaries, are carrying grains of pollen on their exquisite little heads. In this way they help to fertilize the petunia and the trumpet-honeysuckle, and perhaps they do all the fertilizing for the dainty touch-me-not and the great blossoms of the trumpet-creeper.

But, after all, most of the pollen trade is carried on by insects. You may sometimes find grasshoppers, and often find ants, prowling about in flowers ; but they are greedy pollen-eaters, and their bodies are so smooth that but little pollen sticks to them, so they are not of much use to the flowers, and often do far more harm than good.

The beetles are a little better, for some of them are hairy, so that pollen sticks to them, and they carry a good deal of it from blossom to blossom. There are a few flowers that depend mainly on beetles to fertilize them.

Then there are the flies, and especially the bee-flies, that do a great deal for flowers. Most flies, as every one knows, are very fond of sweets, and most of them have a longish tongue with which to lap up nectar. But the queer bee-flies are famously provided for in this way. Look at the long tongue which this bee-fly has, and see how easily he could reach it down into any nectary that was not unusually deep. Then what a velvety fellow he is ! And this hairy



THE BEE-FLY.

nap would be sure to catch a great deal of pollen and carry it away.

Butterflies and moths are of much more importance to flowers than the insects of which I have just been telling you ; for many moths, and all butterflies, live entirely on nectar, and so they must visit flowers very often. Then they are covered with tiny feather-shaped scales (such as come off on your fingers when you take hold of one of these insects), so that pollen clings to them very easily. Children know very well what



HEAD OF BUTTERFLY
(showing proboscis).

a long slender proboscis the butterfly carries. When it is not in use, the proboscis is curled up like a watch-spring ; but it can be unrolled in an instant, and thrust deep down into the nectary of a flower. The great hawk-moths, or sphinx-moths, have still longer probosces. The largest moth of this kind that is found in

the Northern United States has a proboscis five or six inches long, and one has been found in Brazil with a proboscis about eleven inches long.

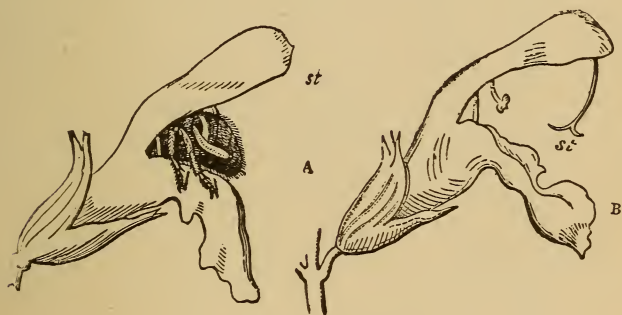
Such moths have special flowers that have adapted themselves to be fertilized by the one particular kind of moth. The nectary of these flowers is far down, out of reach of common insects. Butterflies do all their work by day. Some moths visit flowers by day, but most of them in the evening, just at and after dusk.

The stinging insects — wasps and bees — are among the best of all the friends of flowers. Wasps are not such useful helpers to them as bees, because they feed on many other kinds of food besides nectar, and would rather cluster on a cracked pear or a peach that has fallen to the ground and burst open, than visit the sweetest bed of pinks, or the most beautiful rosebush, that ever bloomed. But the bees are the very best friends to the flower world. There are so many kinds of bees, and so many bees of each kind, that they can do a vast deal of work. Every flower in every head of clover in the broadest field, every apple and cherry blossom in the largest orchard, may have its bee-callers drop in for a second many times in a single day. Bees visit small flowers that the painted butterflies

and the darting hawk-moths would think quite beneath their notice. Even where there is no nectar, the bees will go to get pollen; and though they put most of it in their hip-pockets, they may carry enough about on their heads and bodies to fertilize the next flower that they enter. I would try to tell you about these pockets, but they are such odd, shallow things that even looking at a picture of them would give you only a very poor idea of their shape. You must watch bees at work among the flowers, and see for yourselves how the pollen is packed away in the little basket-shaped enclosures of stiff hairs that make the pockets.

In the last lesson I told you that flowers had hung out their bright colors to attract insects, and this is largely for the sake of the bees. Sir John Lubbock, a famous English naturalist, has made some very interesting experiments, by which he has proved that bees do distinguish colors, and are especially fond of the bright ones. Butterflies are even more refined in their tastes and particular in their choice of colors. Beetles, too, are great lovers of color.

There are so many special arrangements by which flowers have adapted themselves to be fertilized by insects, that numbers of books have been written about the subject. But there is room here to show you only just one of these curious devices. In the picture are two flowers of the *Salvia*. The left-hand flower, A, is younger



FLOWERS OF *SALVIA*,
one visited by a bee.

than the right-hand one, B. The stamens in A are matured, but the pistil is not. It is hidden in the upper lip, to the left of the letters *st*. The pollen-bearing part of the stamens is hinged in such a way that it swings very easily; and when a bee enters the flower, the two sides of a stamen are tilted down over his back so as to

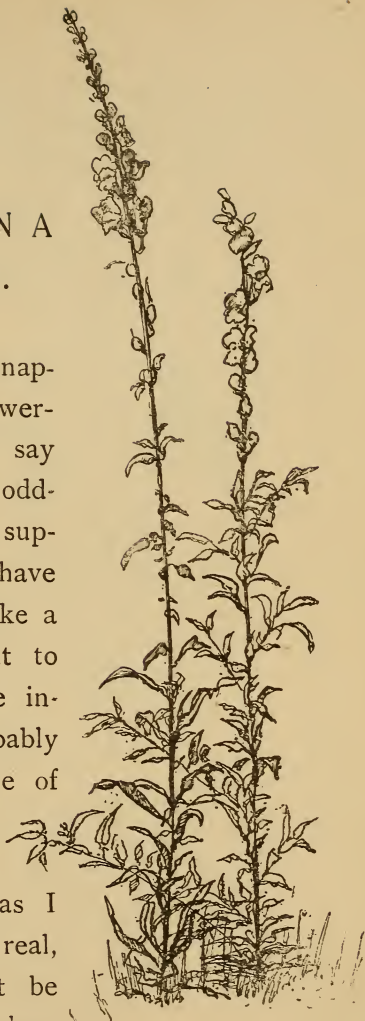
clasp it tightly. You can see one half of the stamen lying against the bee's side, just above his hind leg. Now, when he flies to another older flower, like B, and crawls in from its lower lip, his sides will brush against the tip of the pistil, which you see hanging down at *st*, and the flower will be fertilized. Isn't this flower wonderfully suited to receive and to profit by visits from bees?

“So sweet, so sweet the roses in their blowing,
So sweet the daffodils, so fair to see ;
So blithe and gay the humming-bird a-going
From flower to flower a-hunting with the bee.”

XIX.

A BUMBLE-BEE IN A LION'S MOUTH.

HAVE you any snap-dragons in your flower-bed? If not, I dare say you know these gay, odd-shaped blossoms. I suppose the flower must have seemed to somebody like a dragon's mouth about to snap at or bite some intruder, and so probably arose the usual name of snap-dragon for this plant; although, since no one, as far as I know, has ever seen a real, live dragon, it might be rather hard to tell just how



one's head would look. But perhaps everybody has a pretty clear notion of the way a dragon ought to appear, from the wonderful imaginary

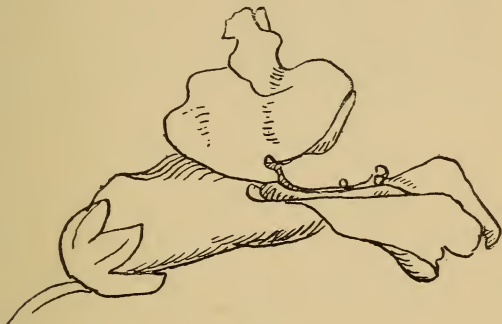


A SNAP-DRAGON BLOSSOM.

pictures that we have all seen of a great, roaring creature all covered with scales, with claw-like feet, flapping wings, a fierce, open mouth, and fiery eyes. I used to hear these flowers called lion-mouths. The children liked to pluck one, and pinching it between the

thumb and forefinger, to hold it toward a playmate, opening and closing the lips of the flower by the movement of the thumb and finger. When the lips are thus held open there is a considerable resemblance to the open mouth of a lion or some other animal. If you have ever thus played

“making mouths” with the blossoms of the snap-dragon, you have already learned that the lips



A “LION-MOUTH.”

(Made by holding the flower upside down and pinching it open.)

are so firmly closed that it requires considerable effort to open them enough to show the deep throat of the flower. The nectary is at the very base of this, as you will find if you pull away the calyx and bite off the least little nip of the blossom, for then you will taste the sweet nectar.

Now let me tell you what I saw last summer while watching some snap-dragons. There was a great bed of them, and what a mass of varied color they made! There were all manner of red shades, maroon, scarlet, crimson, and pink; then there

were orange flowers and pale lemon-colored ones, and white ones and others of mottled pink and white. Most varieties had a velvety bit of rich yellow on the lower lip of the blossom. I had not been five minutes beside this flower-bed, watching the gentle courtesying of the tall stalks loaded above with buds and bright flowers, and thickly clad below with dark-green leaves, before some flying visitors came. I was very near the flowers, but kept quite still; and the winged things did not seem to mind me or be disturbed by my presence. A medium-sized bumble-bee came straight toward the flowers, not as if he were aimlessly wandering, but just as if he knew where he was going and what he was after, and I doubt not he did. After nosing about two or three blossoms, all the while humming and bumbling to himself, he pushed his head under the lip of a full-blown flower and then burrowed his way down into the throat. None but a strong insect could force an entrance into the closed throat or tube. The bumble-bee made a great scratching with his legs, as he perseveringly worked his way toward the nectary to get the sweet droplet for which he came. In a mo-

ment or two I saw him backing out, his head coming out last; he paused just a moment on the lip of the flower to brush off with his legs some of the yellow pollen with which he was well powdered. This cleaning off of the pollen-grains was most deftly done, and at once recalled Jean Ingélow's pretty verse:—

“ O velvet bee, you 're a dusty fellow,
You 've powdered your legs with gold ! ”

On either hind leg I saw a roundish little object as yellow as gold; these were the tiny open-work hair baskets, packed with pollen. I saw dozens of bumble-bees of several different kinds come and go in an hour. All behaved pretty much alike, though some of them on backing out of the blossom were silent, while others kept up a sort of querulous buzzing.

Other smaller, weaker insects,—flies and some very small kinds of bees,—came to the bed of snap-dragons, but although they tried they were unable to enter the fresh flowers. I saw some of these feeblar creatures crawl into old flowers that had lost their spring by partially withering. Probably most of these insects came to eat pol-



len. Gardeners have found that if, during their flowering season, snap-dragons are protected from bees, by closely covering them with netting, they will mature no perfect seeds; but if left free to receive visits from their trusty friends, the bumble-bees, they send their pollen by them from flower to flower and from one bed to another, paying the busy bustling fellows with nectar and pollen. When Jack Frost comes to tell the late buds on the tips of the flower-stalks that blooming time is over, the irregularly rounded seed-vessels are full of little ripe black seeds which are sifted out over the ground (if you don't gather them) through three little chinks that open for this very purpose. Snap-dragons must like to amuse themselves by

grimacing; for after spending their flowering days in making dragon-mouths, or lion-mouths, or what you will, they end their innocent lives by turning their brown seed-pouches into the queerest little elfish faces, — some look like tiny monkeys, others like laughing little imps. Two of the seed-openings make the eyes, the third little slit forms the mouth, and near the middle of the triangle made by eyes and mouth clings the withered style, which makes the funniest little nose that ever you saw. Each little brown, dwarfish face is crowned with the dried-up calyx, that makes a pointed cap like those worn in old times by a king's jester.



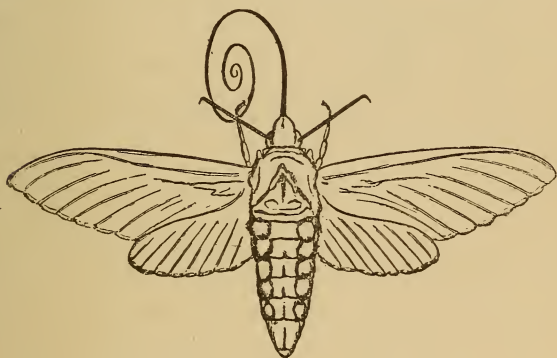
XX.

A MOTH'S VISIT.

“You night moths that hover where honey brims over.”

It was in the early twilight one clear, warm summer evening that an old moth peeped out from under the cap-board of a fence where he had lain concealed during the hot sunshine of the day; and after his great eyes, which are set so far out on his head, saw that the last ray of the sun had disappeared, he came out from his hiding-place. He stretched out his wings, saying to himself, “Now, perhaps I can with some comfort go and find something to eat, and enjoy the evening air, made so sweet by some of our flower-friends. There is little peace for us moths in flying, so long as all those sun-loving creatures, the bees, wasps, and flies, are buzzing about in one’s path, and like enough crawling down into the very flower-cup into which I might have a fancy to dip

my proboscis. It was very, very wise of my ancestors that they agreed ages ago to scatter pollen for certain plants on condition that their nectar should be kept secure from the whole tribe of plundering bees, and even from our relatives the brilliant butterflies, since they, too, choose to go abroad only when the sun shines. I should n't wonder if it is



OUR SPHINX MOTH that visits the Evening Primrose.

just to show off their fine clothes ! And so, for a longer time than any of us moths can count, a good many blossoms hide their nectar away in long tubes, or spurs, out of the reach of these busy meddlers that are forever flitting hither and thither in the daytime ; but even this precaution of shutting our sweet food up in deep cups, fashioned for

this very purpose, was not enough, for some of those great, noisy bumble-bees, always hungry for honey, actually lengthened their tongues, so that they can reach all but the very deep nectaries. A few trusty flowers, however, have promised to keep closed through the day, and to open only after sunset, when we love to go out on our travels. Such blossoms generally have the sense to wear white or buff or yellow petals, and are very sweet-smelling, so that we easily find them, even on dark nights. But I must be off."

And away he darted on swift wings. He hovered a bit over a petunia-bed full of crimson and white flowers, now and then with a quick movement uncoiling his long trunk and thrusting it down into a blossom for nectar, and then away he went down a quiet green lane. He knew what was there waiting for him, for he had been there before; and besides, the dewy air was heavy with the strong, sweet perfume wafted from some evening primroses that straggled along one side of the lane.

Pretty soon he saw something shining out ahead of him, and he made straight toward the pale yel-

low flowers which were beckoning to him. The first flower he reached whispered softly, "You may have your supper; but it's little pollen you can carry for me, for some late-flying bees called here to fill their baskets with pollen to carry home to their greedy babies. Of course a little pollen-dust may have stuck to their coats, and so possibly get to the other primrose pistils, but every single bee tried to pick off every yellow speck and tuck it in his pocket." Some blossoms had been very cautious, and did not spread out their delicate corollas until they actually heard the whirring hum made by the wings of their night visitor.



AN EVENING PRIMROSE.

Before dipping down into a nectary, which in these flowers is at the end of a long, slender tube, the great moth hovered over the blossom just as a humming-bird does, and with his rapidly moving

wings made a whirring, humming noise very like that made by these graceful little birds.

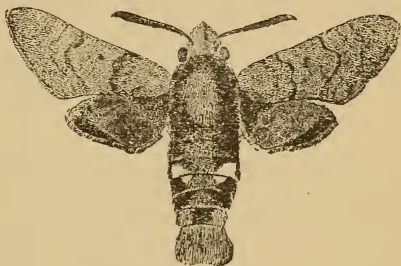
For this reason the great-eyed sphinx-moths are often called "humming-bird" moths. They are also called "hawk-moths," because they hover over blossoms in much the same way in which hawks do over their prey before darting down to seize it. There are a good many different species of sphinx-moths. Sometimes one flies in at an open window on a summer evening, and is afterwards found dead at the foot of a lamp.

The particular one that visits our evening primrose and helps to fertilize its seeds is a very large moth. A different and somewhat smaller one with gray wings in front, that are prettily marked with dark dots and curved lines, and with the back wings of a rusty yellow, does the same work for the evening primroses in Germany that its cousin does for these flowers in America.

If you have the sweet-scented honeysuckle growing in your yard, go out some warm evening and stand near it after twilight; and if you like its perfume well enough to keep perfectly quiet and wait, you will be pretty sure before very

long to hear the loud "hum, hum, hum" of a sphinx-moth as—called by the sweet breath and light color of the blossoms—he hovers over the nectar-tubes and takes his delicate supper. The

one that frequents honeysuckle vines is different from either of the sphinxes that visit the evening primrose. Other moths besides these hawk-moths



THE GERMAN SPHINX MOTH
that visits the Evening Primrose.

visit flowers, and if you choose you may find out the very ones that are in the habit of going to certain plants. White, or very light-colored blossoms, that are sweet-scented, are the best ones to watch. I have seen small whitish moths, that look much like butterflies, abroad in the early twilight, and they were doubtless on their way to flowers. There is much still to be learned about the fertilization of flowers by insects, and you may, by patient searching, find out some of the things we do not yet know.

XXI.

A NIGHT-BLOOMING FLOWER.

IN one of the greenhouses in the Botanic Garden near where I live is a large cactus. I want to tell you something about this plant. The gardener asked me one day to come and see it; and I followed him to one end of the room, where waving palms, tall bamboo-canes, and many other tropical plants grew; and there I saw trailing up the wall a great brown stem that grew from long clustered roots which were partly beneath the earth in the floor of the hothouse and partly in the air. At the upper end of the main stem, close to the glass roof, grew multitudes of the thick, fleshy, three-cornered branches, around which here and there, in little notches along the edges, were tufts of bristles, that told me I had found the cactus.

This particular kind is one of those called "night-blooming Cereus," because its flowers open only during the night. Each of its flowers is almost as large as your head, and the rows of snow-white petals look like wax. There are several ranks of long, graceful sepals that turn outward from the petals, falling down in beautiful curves. The color of the sepals is so lovely that to know it you would have to see it. They are of a very rare light-green, sometimes almost white, and again of a pale buff, on the upper surface. The cup bears hundreds of slender, quivering stamens. The delicate straw-colored anthers¹ are borne on creamy, thread-like stalks. The stamens slightly curve towards the tall pistil, which rises in the centre of the flower. The cream-white style, in the blossom I examined, was nine and a half inches long, and of about the size of a pipe-stem. The stigma (which, you must all remember, is the outer end of the style) is coarsely fringed, so as to make a sort of spreading tassel. The stamens spring from

¹ The anthers are the little pouches that hold the pollen, borne on the ends of the stamens.

the inside of the calyx-tube or cup of the flower ; but they grow in ranks or rows, at different heights along this cup, so that the upper ones seem to be much shorter than the lower ones, and those that seem the tallest, because they are attached near the top, do not reach within an inch of the tip of the pistil. Please try to remember just how these beautiful stamens are placed about the pistil, because you will by-and-by see why they stand just as they do.

Well, the other night a wonderful thing happened,—all in the dark stillness of the greenhouse. What will you think or say when I tell you that sixty of the splendid starry cups of the great cactus one by one opened in a single night? What a sight for the flower fairies it must have been! The gardener gave me one of the beautiful things, and I had it put away in the refrigerator, where it would be kept cold until next day, hoping that it would not close in the early morning like its sister flowers on the stem where they grew. And it did keep fresh and open ; so that in the afternoon of the next day I sent it to the photographer's to have its picture

taken.¹ To be sure, the picture cannot tell you about the size of the flower, nor about the pure whiteness of its petals, nor the way in which the slender sepals shade from buff to pale green ; but you can see the upper end of the great pistil and the crowded stamens, and learn something of the shape of the flower.

¹ See frontispiece.

XXII.

A NIGHT-BLOOMING FLOWER

(CONTINUED).

Now, why do you suppose these giant blossoms choose to unfold their beauty in the night? In Nature there is a reason for everything that happens, if we are only able to find it out. To get at the reason for the night-blooming of the cereus, we must remember that its home is in tropical Mexico, where insects are more numerous than with us. Many of them fly after nightfall; and among these is a kind of moth that is very fond of the nectar of the great white blossom of which I have been telling you.

When I cut down through one of these flowers, I found several drops of thick sweet nectar in the large nectary at the base of the pistil. You see, the nectary of this flower is so deep that it would be hard for a bee to get at it; but my lady moth just unrolls her long proboscis, and

easily sips her dainty supper from her royal dish. Every moth that visits a *Cereus* to get its nectar must needs brush against the multitudes of stamens that, as we may say, line the cup. Now, if the pollen on the anthers is ripe and ready to fall, you see that the head, proboscis, and front wings of the moth will be sprinkled with the shower of pollen-dust; and as the pistil rises a good deal above even the uppermost stamens, as the moth dips down into the next blossom most likely some of the pollen will fall on its tasselled stigma. And so on, from one flower to another, the pollen will be carried by this night-flying moth. Thus the seeds will be fertilized; that is, made so that they will grow.

When I cut through my great blossom I found in the seed-vessel that is below the nectary a great many small white seeds; but in our climate these seeds never become perfect, because the particular moth that in Mexico, in its nectar-seeking, carries the pollen of one flower to make perfect the seeds of the next, is not here to do this useful work. In its own warm country, too, the thick, fleshy seed-vessel ripens into a juicy fruit that is eaten

by the people who live there ; but with us this gradually withers away after the blossoming is over. The *Cereus* has considerable fragrance, and this and the shining whiteness of its petals help the insects that feed upon their nectar to find these flowers in the darkness. Now do you see why this plant opens its wonderful flowers after dark ? If a new plant is wanted by our greenhouse gardeners in the Northern States they must make cuttings and plant them with care ; but where the cacti grow wild, on the highlands of Mexico, their seeds must be matured and self-sown in order that the stock may not die out. And this, you see, is wonderfully brought about by the useful habit the *Cereus* has formed of opening its flowers after nightfall, when its pollen will be carried about by certain moths which fly and feed at that time.

XXIII.

COMPOUND FLOWERS.



I KNOW of few prettier sights than a field of ox-eye daisies waving in the soft June winds. Children love to gather and play with the daisies wherever they grow. They will not grow in all parts of our own country, but are so common in most parts of New England that the farmers would be glad to be rid of them. Although they are so lovely they do not help to feed the cows and sheep and horses, and the farmers would far rather have the meadows and pastures covered with good grass. These beautiful white and gold blossoms were in early times brought to our country from England, where they thickly dot the fields and waysides. The English children pick them and weave them

into chains and tie them into great bunches, just as you do here when you want to trim your school-room for some festival.

Did you ever, with your pen and ink, draw eyes, nose, and mouth, to imitate a face, on the bright yellow centre of a daisy, and then with a pair of scissors cut its white border into notches, so that it looks like the ruffle of a cap? Two of the long white strips that make the outside of the daisy must be left uncut; they make the strings of the cap. One who is clever at drawing can make many kinds of faces, each framed in the white cap-border.

If you pick a daisy to pieces, you will see that the centre is made up of many separate parts; and if you look at one of these parts under a magnifying-glass you will see that it is a tiny single flower,



shaped much like a honeysuckle blossom. Here is a picture of one of these simple little flowers as it looks when seen under a glass.

A great bundle of these slender, tube-shaped flowers make the yellow centre of the daisy. The white border is made by a row of single flowers of a different shape. Each of these white flowerets has a strap-shaped part growing out from one side; this is the shape of one of them.



A CENTRAL
FLOWER.

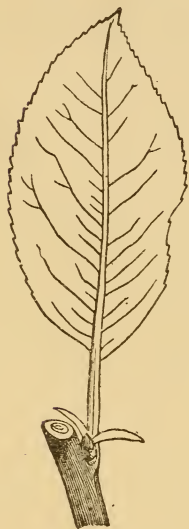


A BORDER-
FLOWER OF
THE DAISY.

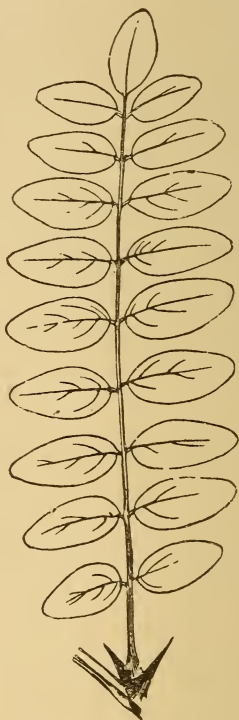
Flowers like the daisy, which are made up of a great many small single ones, are called *compound flowers*. I dare say you know many of this kind, such as the dog-fennel, that grows along every roadside; the clean-smelling tansy, found in old gardens; the bright marigolds; and the great yellow and brown sunflowers.

This grouping of tiny flowers into a mass is very useful in helping them to be fertilized by insects. Small flowers might easily be overlooked by flying insects. But you can easily see that a group of such little

flowers might make as much show, and be as attractive to insects as a single large blossom. In such flowers as the daisy, the many kinds of asters, the cone-flowers, in some places called "Black-eyed Susans," with their bright yellow margins



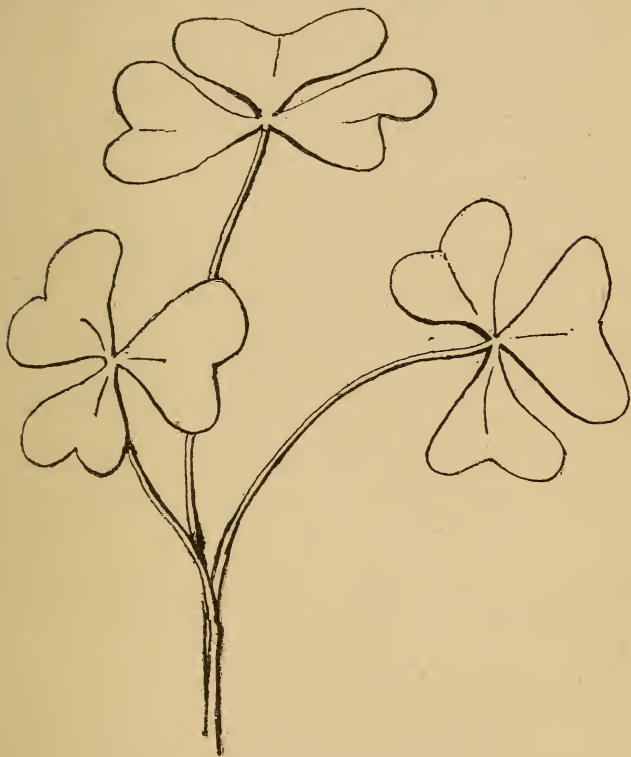
A SIMPLE LEAF.



A COMPOUND LEAF.

and brown-purple centres, the tame and the wild sunflowers and *Coreopsis*, there is a striking con-

trast of colors. The border-flowers, or as botanists call them, *ray-flowers*, are broad and ribbon-



A COMPOUND LEAF.

shaped, while the whole inside of the head is packed full of little tubular flowers. The rays

have little else to do but to hang out their bright flags to call insects, and then the little central tube-flowers feed these visitors when they come with their stores of honey and pollen.

While speaking of compound flowers, perhaps it is as well to say a word about compound leaves. If you look at a locust-tree or at a rosebush you will see that it has rows of single leaves along slender stalks which spring from the twigs ; and in the horse-chestnut, the hickory, and the Oxalis you will see groups of leaves borne on the ends of stalks, from which they spread out in a sort of fan-shape, like the fingers of a hand. The stalk with all its *leaflets*, as the little leaves are called, is called a *compound leaf* by the botanists.

XXIV.

PLUMED OR FEATHERED SEEDS.



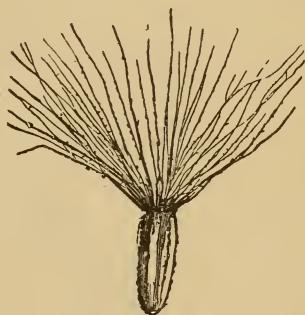
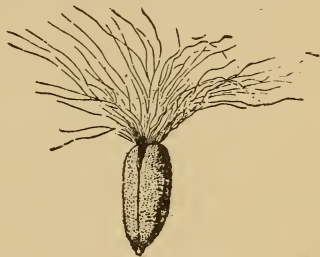
DANDELION SEEDS.

“LET me see if my mother wants me,” said Jack, when the boys coaxed him to stay to play ball a little longer. He broke off the long stem of a dandelion that had gone to seed, and blew three times at the feathery globe. As a few of the daintily plumed seeds¹ were still left clinging to the head after the third puff, he sprang back for one more game of catch. You all know

¹ What you call a dandelion-seed is really a tiny, thin-coated pod that holds one seed. As you have not yet learned about the different kinds of seeds and seed-pods, in telling you how seeds travel from one place to another I shall use the word “seed” in a general way, just as you do. Sometimes I shall mean a naked seed—as in the case of the seed of the milk-weed,—and sometimes a seed inside its pod—as in the case of the dandelion or the grass-seed.

this pretty custom of playing that the flower-seeds can answer questions, and I dare say have consulted them many a time, and felt quite sure you would get the answer which you wished, that would let you tarry at your play; but I fear dandelions do not always know, and that the mothers sometimes have to wait for their boys and girls. In some places children ask the time of day, and pretend that the number of seeds left tells the hour. All this is play, of course; but it is more than mere play to the seeds that sail off so lightly through the air when children blow them loose from the tiny white, fairy-like cushion where they have rested. Each brown seed so set afloat is thus sent out on what you may call its life-journey; for the end of its voyage through the air, on the spot where each seed at last falls and settles down on the earth, finishes its travels as a seed. But if it has fallen on "good ground," and sun and rain favor it, a young dandelion will in due time spring up, from which, in the second year, will bloom many golden flowers, and they in turn will give place to the feathery seed-globes. These seeds do not wait, however, for children to

send them off to find homes where they may take root and grow; but when quite ripe the wind loosens them and bears them off, some far away, while others are dropped near the plant



SOME PLUMED SEEDS.

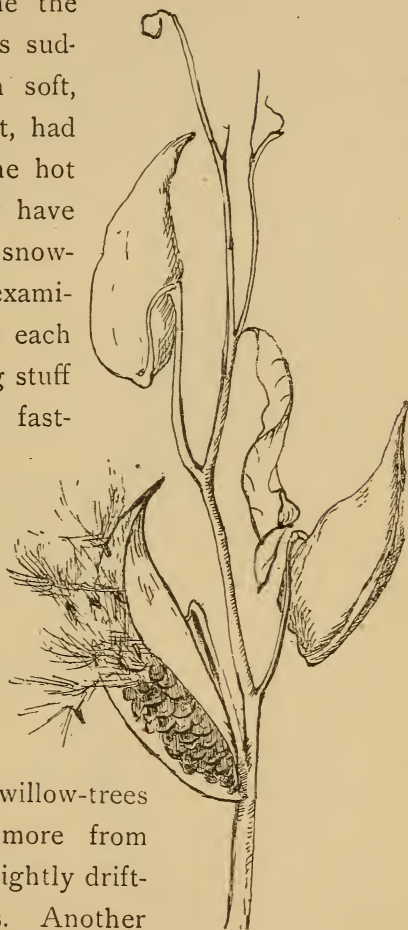
which bore them. So you see that the plumes which shoot out from the tops of the dandelion-seeds are of great use in scattering them. With-

out some such sail, by which the wind may carry off the seeds, they might fall on one little spot of earth where there would be room for only a very few of them to grow.

A great many kinds of seeds besides those of the dandelion are provided with some means of travelling. Many fly or sail through the air, others swim on the water, and a great many are able to fasten themselves in one way or another to animals, and so secure rides to distant places, where they may find new homes. Thistle-seeds; those of the Clematis or virgin's-bower, which is often trained over porches; those of most grasses; the seeds of all the pines, and of many more trees and smaller plants, — all are adapted to be blown about by means of plumes, feathers, silky down, or delicate wings. I have seen the air alive with thistle-down on an autumn day, when a good breeze had shaken loose the lovely silken things that take the place of the purple thistle-flowers.

If you examine a thistle-blossom you will see at once that it is a compound flower made up of a great many slender blossoms; so, of course, these will be followed by a large number of seeds.

One day in June the air about me was suddenly filled with soft, downy flakes that, had it not been for the hot sunshine, I must have thought to be a snow-storm. Upon examination, however, each bit of the floating stuff was found to be fastened to a tiny brown seed. It was a shower of willow-seeds blown by a brisk west wind from the ripened catkins of a grove of willow-trees half a mile or more from where I met the lightly drifting little travellers. Another seed which is well fitted to be



MILKWEED.

carried by the wind is that of the large milk-weed. If you do not know these seeds, open one of the great seed-pouches, when quite ripe, and see the shining,



white, flossy tuft
of silk that
crowns' each one of
the flat brown seeds.

This plant is sometimes
called silk-weed.

XXV.

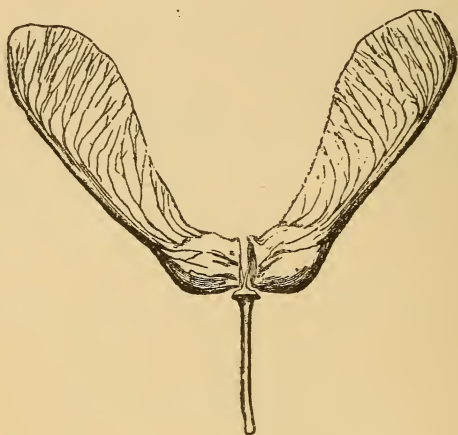
WINGED SEEDS.



SOME DRAGONFLIES.

I TOLD you that some seeds or seed-pods had wings by which they could be carried by the wind. I am sure you have seen some winged seeds and have played with them, and of some, perhaps, have eaten the little seed-kernel ; but maybe you have not thought much about their thin wings, and of their use in scattering the seeds. I think you all must know the fruit of the maple-tree. Two gauze-winged seed-pods are fastened to one slender stem. Children often pop open the seed-cases when they are ripe and dry, and eat the seed within. The

thin, beautifully-veined wings look much like the wings of some insects, such as dragonflies. But the seeds cannot move their wings at will in flying, as insects can, or balance themselves in the air on quietly outstretched wings, as do the glittering



WINGED SEEDS OF MAPLE.

blue or brown dragonflies, and the lovely pale-green creatures commonly known as lace-wings.

The insects make their wings carry them where they wish to go, but the winged seeds must fly or sail wherever the wind may chance to bear them.

I have spoken to you about my young friend

Jack. In a box that stands among his winter flower-pots he has a strong, healthy little maple-tree about a foot and a half high. I saw this treeling, and wondered how he came by such a thing among his geraniums, begonias, heliotrope, and so on. He told me how one very windy day last September, as he was passing along a fine old street in Cambridge, a gust of wind blew a swarm of leaves and seeds all about him. He snatched at the hurrying things, and found, on opening his hand, that he had caught a pair of twin maple-seeds. He tucked them into his pocket, and after coming home broke them from their stem and planted them in his flower-bed. The seeds did not wait for spring to come before sprouting, but Jack says that in a very short time two tiny maples put their heads above ground. Jack carefully dug up one and planted it in the box of earth, where it has been growing just as fast as it could all winter. Its twin, that was left out of doors, seems in this early spring-time to be alive.



AN ASH-KEY.

Ash-keys, as in some places children call the pretty, wedge-shaped fruits of the ash-tree, are also well-fitted to be blown about by the wind. You



SEED OF CATALPA.

have all seen showers of elm-seeds borne along by a good breeze. Each small seed is fastened, near the middle, to the delicate shield that covers it and extends around it in a circular wing, so that these seeds are very light and easily carried.



A PINE-TWIG WITH ONE CONE
(much reduced in size).



A PINE SEED (b),
WITH ITS WING (a).

The catalpa-tree's showy white flowers, all mottled with gold and purple, are followed by long pods, in which are packed many seeds, winged much like those of the elm, only the curtain-like wing of the catalpa-seeds is slit, so as to make a coarse fringe around the seed.

The best way to study the seeds of the pine-tree is to get one of the brown cones in the fall and put it for a few days in a warm, dry place ; then the thick, stiff scales will open, and let the little seeds, with their wide, thin, papery borders, drop out. You will see that they can fly well, because they are so very light, though their wings are not as large as those of the ash or the maple-seed.

There are a great many other kinds of seeds with plumes, or wings, besides those of the dandelion, the thistle, the milkweed, and the trees of which I have just told you ; but none are more interesting than these. Perhaps you can find out for yourselves what some of the others are.

XXVI.

STICK-TIGHTS.



SOME STICK-TIGHTS.

MANY seeds that are neither plumed nor winged so as to be easily caught up and scattered here and there by the wind fasten themselves either to the fur or hair of animals or the clothing of people, and so are able to travel away from the place where they grew. You have often had to pick out burs from your stockings or other clothes after

a tramp in the woods or

pastures. Maybe you only thought of the bother of picking out the seeds that cling so closely to the fibres of woollen cloth, and did not think how you had, free of charge, been giving a ride to many silent little people. These tiny brown

or green wood-folk are dumb, and cannot ask to be carried ; but whenever any creature touches them to which they can cling, they take tight hold with their many funny little hooked fingers, and ride away at their ease. Bur-bearing plants that one sees growing along a highway often have come from seeds scattered by some woodland rambler who sat down by the roadside to rest and remove the little "stick-tights" from his clothes. In some places this is the everyday name given to one kind of seeds that fasten themselves to wool or clothing. Many of these clinging seeds hold on by means of prickles that have tiny hooks on their points ; others are armed with two or more sharp, straight slender needles growing out from one end, and these fine needles run through wool or any soft material that chances to brush against them, and are not easily dislodged.



A BURDOCK BUR.

A common name for some of the latter kind of seeds is "Spanish needles." You all know

burdocks, — the great weeds that grow in clumps in barnyards, garden corners, waste ground, and



A BURDOCK HOOK
magnified 25 times.

often by the roadside. When this plant is in bloom, if you examine one of the dull pink flowers you will see that this compound flower is held together in a green vase-shaped bur. Children often gather these large burs and stick them together into little baskets which look very pretty. Well, as the burs ripen, the tough hardened hooks that make them catch hold of anything to which they can stick ; and so the seeds of this coarse, bothersome weed are scattered far and wide. There are a great many seeds inside each bur ; and that is

why we usually find burdocks growing in crowded clumps, though, of course, not all the plants that might grow from a single bur can flourish on the same spot of ground where the seeds sprouted. One of the most troublesome of all burs is the sand-bur, which

grows abundantly on the sandy shores of the Great Lakes, and along the rivers in the Central States, and which tortures the foot of every barefooted boy who steps on it.

Have you ever seen the large hooked pod of the Martynia? One kind of Martynia is grown in vegetable gardens, and many children know the pods well, after they have been made into pickles. They are



A SAND-BUR.



A MARTYNIA-POD.

often called "mice," because they are so furry, and have such long slender tails. When these great

pods are quite dry and ripe their hooks become almost like horn. They seem to have acquired these hooks to enable them to fasten themselves to animals which can carry them about. In South America they are often caught by the tails of half-wild cattle, and thus are carried hundreds of miles over the dry plains. Seeds that become entangled in the hair or fleece of animals frequently travel a long way from their home, sometimes even across an ocean. A few years ago, in a New England town where there were large wool-cleaning works, a gentleman one day saw several strange plants which he knew did not belong to our country. It was found that these foreign plants had sprung from seeds that had stolen their passage either from Australia or South America, along with some imported wool.

XXVII.

OTHER WAYS BY WHICH SEEDS TRAVEL.

IN order to steal a ride, seeds need not be provided with hooks. Everybody knows that most of our pulpy fruits have seeds that for some reason are not fit to eat. Peach-stones and plum-stones are too hard to be cracked by the teeth. The seeds of raspberries and blackberries are so small and hard and tough that they do not get chewed as we are eating the fruits to which they belong, and in cranberries, blueberries, figs, and many other fruits the seeds are so very small that most of them are not crushed between the teeth of the one who eats them. In apples and oranges the seeds are so bitter that it is pleasanter not to bite into them. Now all these and hundreds of other uneatable seeds, growing in sweet and juicy fruits, are examples of beautiful provisions of Nature to insure the scatter-

ing of the seeds. Whatever animal it is that eats such fruits, from the great black bear in a blueberry swamp, to the beautiful wild pigeon, feeding upon raspberries in the burnt pine woodlands, carries away hundreds or thousands of undigested seeds, to scatter them far and wide, where they may grow in new places.

There are still other ways in which seeds manage to get about the world. You all have seen the various-colored garden balsam. Some people call these flowers lady-slippers, or touch-me-nots. The latter is a queer name, isn't it? Why do you think it was given to the balsam, with its red or pink, or white or spotted blossoms? It is because of its seed-pod that the plant is called by this fitting name of touch-me-not. Did you ever play with the seed-pods when they were quite ripe, and see how by pinching one slightly with your thumb and finger it would pop open, scattering the round brown seeds in all directions? As the pod bursts, its sides split into several parts, and each one of these instantly curls up, and it is this motion that shoots forth the seeds. I have often seen a little boy or girl very carefully pluck a balsam seed-pod by

its short stem, so as not to burst it, and then, after asking another child to hold out his hand, softly lay the little green bag of seeds in the palm of the outstretched hand, telling the owner to close it. Of course the pressure at once bursts the pod; and the queer crawling sensation made by the



WILD TOUCH-ME-NOT.

pod as it splits and curls itself up into a little heap, and by the seeds trying to jump about, is apt to make the child start and quickly open his hand to see what kind of a living thing he has been holding.

The wild balsam, which to my mind is far prettier than the larger-flowered kind cultivated in

gardens, has more delicate and easily-opened seed-pouches. I hope you all know this plant, with its graceful hanging yellow blossoms mottled with red or brown. The unusual shape of the lovely flowers has given a great many names to this plant. In some places it is called touch-me-not, or jewel-weed ; in other places it is known as lady's slipper, lady's pocket, or lady's eardrop. Not long ago I came across a rare old book that was written ever so long ago, soon after New England began to be settled. It tells of things found in the new world of America. Among other wonders that are described in this book is our wild balsam, which was found growing in Massachusetts ; only the writer calls it "humming-bird-tree," perhaps because he thought the flowers looked like tiny humming-birds, or more likely because these pretty creatures are often seen flitting about the balsam to sip the nectar from the swinging, jewel-like blossoms. Of all its names, touch-me-not seems to me the most suitable one for the balsam.

"Touch-me-not," "touch-me-not," the smooth, slender seed-pods whisper ; "if you touch me, I'll pop open and shoot out every one of my seeds."

The pale-green walls of the pod are sometimes so thin and transparent that one can see the seeds within, waiting till the time shall come for their little prison to fling open its doors and let them leap out into the great world.



SEED-POD OF THE WILD
TOUCH-ME-NOT.



THE SAME BURSTING.

Our common wild pink geranium, often called crane's-bill, which is related to the touch-me-not, also scatters its seeds by having the seed-pouches spring open in a curious way. Such seeds do not generally travel very far, but for the most part lie where they drop, after one quick jump from their tiny home; but as they go in various directions, the new plants that spring from them will not be crowded.

One very important way in which seeds travel from place to place is by swimming or floating on water. In this way seeds sometimes journey hundreds or even thousands of miles from where



RIPE PISTIL OF THE
WILD GERANIUM.



THE SAME BURSTING.

they grew, and after being washed on shore often sprout, take root, and grow. Many of the tall cocoa-palm trees which, as you have read, grow on islands far out at sea, have sprung from brown cocoanuts whose shaggy coats helped them to float far, far away from the trees that bore them on distant shores.

The great naturalist, Mr. Darwin, found out

that many kinds of seeds, both large and small, are able to grow after soaking even in salt sea-



A COCOA-PALM AND A BREAD-FRUIT TREE.

water for several weeks. Seeds fall into ponds, brooks, or rivers from overhanging plants, or are carried there and dropped by the wind, and the

flowing streams carry them on, — some falling to the bottom after becoming water-soaked ; others lodge on the banks ; and still others float on and on until they reach the sea, and then there is no telling what may be their fate. They may drown, or float to lands where such plants as bore them have never yet grown.

“ Is it the palm, the cocoa-palm,
On the Indian Sea, by the isles of balm ?
Or is it a ship in the breezeless calm ?

.
Branches of palm are its spars and rails,
Fibres of palm are its woven sails,
And the rope is of palm that idly trails !

What does the good ship bear so well ?
The cocoanut with its stony shell,
And the milky sap of its inner cell.”

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